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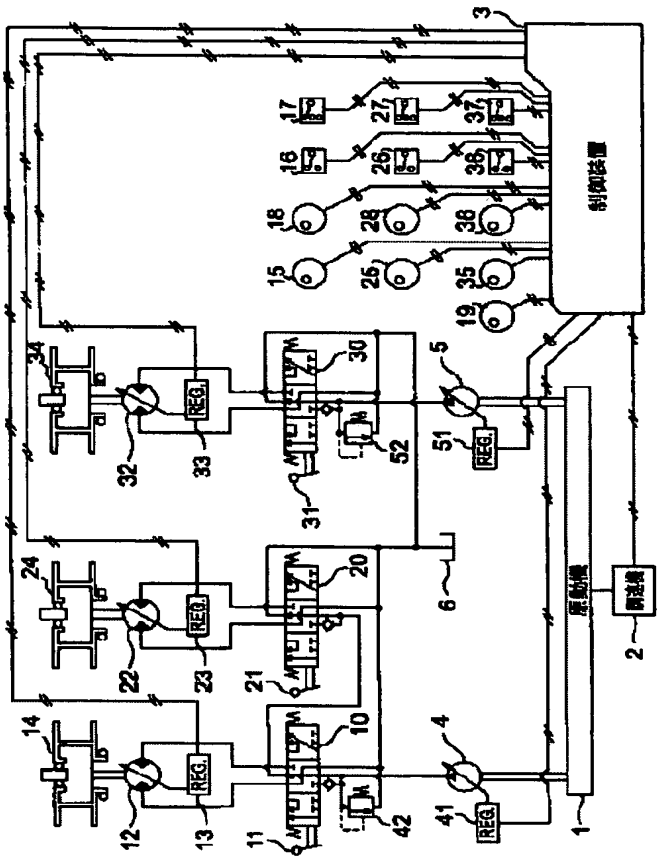
TITLE : DEVICE FOR SETTING MAXIMUM SPEED OF HYDRAULIC MOTOR OF CONSTRUCTION MACHINE



ABSTRACT : PROBLEM TO BE SOLVED: To allow an operator to easily set the maximum speed of a hydraulic motor while operating an arbitrary operation lever and easily change the operation mode to the one suitable for the working environment or working condition.

SOLUTION: Knobs 15, 25 and 35, interlocking changing switches 16, 26 and 36, and mode changing switches 17, 27 and 37 for setting the tilting rotation angles of an inclination angle adjuster 41 of an auxiliary hydraulic pump 4 and an inclination angle adjuster 51 of a main hydraulic pump 5 are mounted at the tops and the heads of an operation lever 11 for derricking, an auxiliary operation lever 21 for hoisting and a main operation lever 31 for hoisting respectively. In operating the device, as well as a mode (a) in which the quantity of inclination of a motor, the quantity of inclination of the pumps, and the rotation frequency of a prime mover can be changed at the same time by changing the interlocking changing switches to the interlocking side and changing the mode changing switches, a mode (b) in which only the quantity of inclination of the pumps and the rotation frequency of the prime mover can be changed at the same time and a mode (c) in which only the quantity of inclination of the motor and the quantity of inclination of the pumps can be changed at the same time can be selected.

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(54) DEVICE FOR SETTING MAXIMUM SPEED OF HYDRAULIC MOTOR OF CONSTRUCTION MACHINE

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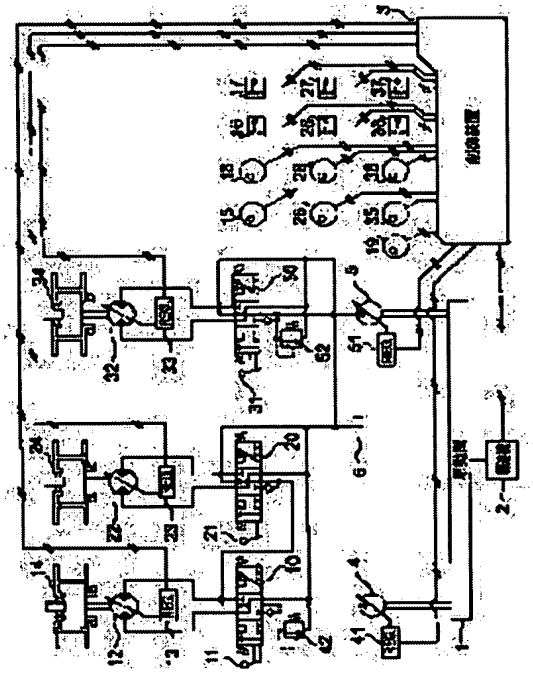

inclination of the motor and the quantity of inclination of the pumps can be changed at the same time can be selected.

LEGAL STATUS

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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] Two or more control levers for changing and operating two or more direction selector valves which change the direction and flow rate of the hydraulic oil breathed out from the hydraulic pump which drives on a prime mover and carries out the regurgitation of the hydraulic oil, and this hydraulic pump, With the hydraulic oil which flowed through said direction selector valve, two or more pivotable hydraulic motors, Two or more tilt angle adjustment devices which adjust the tilt angle of this hydraulic motor or said hydraulic pump, By controlling the speed governor which adjusts the rotational frequency of said prime mover, and said tilt angle adjustment device and said speed governor, and making the tilt angle of said hydraulic motor or said hydraulic pump, or the rotational frequency of said prime mover set it as a predetermined value In the full speed setting device of the hydraulic motor of the construction equipment equipped with the control means which sets up the full speed of said hydraulic motor The interlocking circuit changing switch for changing interlocking actuation and actuation in which it does not interlock, near the grip section of two or more of said control levers, When this interlocking circuit changing switch is changed to a linkage side, by actuation of the control lever concerned The rate input means for inputting the command value which adjusts the rotational frequency of said prime mover which drives the tilt angle of said hydraulic motor by which motion control is carried out, the tilt angle of said hydraulic pump which supplies hydraulic oil to the hydraulic motor concerned, and/or the hydraulic pump concerned to coincidence The full speed setting device of the hydraulic motor of the construction equipment characterized by arranging, respectively.
[Claim 2] Two or more control levers for changing and operating two or more direction selector valves which change the direction and flow rate of the hydraulic oil breathed out from the hydraulic pump which drives on a prime mover and carries out the regurgitation of the hydraulic oil, and this hydraulic pump, With the hydraulic oil which flowed through said direction selector valve, two or more pivotable hydraulic motors, Two or more tilt angle adjustment devices which adjust the tilt angle of this hydraulic motor or said hydraulic pump, By controlling the speed governor which adjusts the rotational frequency of said prime mover, and said tilt angle adjustment device and said speed governor, and making the tilt angle of said hydraulic motor or said hydraulic pump, and the rotational frequency of said prime mover set it as a predetermined value In the full speed setting device of the hydraulic motor of the construction equipment equipped with the control means which sets up the full speed of said hydraulic motor The interlocking circuit changing switch for changing interlocking actuation and actuation in which it does not interlock, near the grip section of said at least one control lever, When said interlocking circuit changing switch is changed to a linkage side, by actuation of the control lever concerned While arranging the rate input means for inputting the command value which adjusts the rotational frequency of said prime mover which drives the tilt angle of said hydraulic motor by which motion control is carried out, the tilt angle of said hydraulic pump which supplies hydraulic oil to the hydraulic motor concerned, and/or the hydraulic pump concerned to coincidence, in the location of arbitration When said interlocking circuit changing switch is changed to a linkage side, by actuation of the control lever concerned 3 linkage mode in which the rotational frequency of said prime mover which drives the tilt angle of said hydraulic motor by which motion control is carried out, the tilt angle of said hydraulic pump which supplies hydraulic oil to the hydraulic motor concerned, and the hydraulic pump concerned can be adjusted to

coincidence, The full speed setting device of the hydraulic motor of the construction equipment characterized by arranging the mode change means for changing at least two modes with 2 linkage mode in which either the tilt angle of the hydraulic motor concerned, the tilt angle of the hydraulic pump concerned or the rotational frequency of the prime mover concerned can be adjusted to coincidence.

[Claim 3] It has two or more hydraulic pumps driven on a prime mover, and a rate input means is a tilt angle input means for inputting the set point which sets the tilt angle of the hydraulic pump which supplies hydraulic oil as a predetermined value into the hydraulic motor in which motion control is carried out by actuation of a control lever. By inputting the set point into this tilt angle input means The rotational frequency of the prime mover which drives the tilt angle and/or the hydraulic pump concerned of said hydraulic motor with which this hydraulic pump supplies hydraulic oil with the tilt angle of said hydraulic pump so that it may be set as a predetermined value by coincidence, respectively The full speed setting device of the hydraulic motor of the construction equipment according to claim 1 or 2 characterized by carrying out.

[Claim 4] When a interlocking circuit changing switch is changed to an un-interlocking side, by actuation of the control lever concerned Two tilt angle input means for inputting the set point which sets independently the tilt angle of the hydraulic pump which supplies hydraulic oil as a predetermined value, respectively into the tilt angle of the hydraulic motor by which motion control is carried out, and the hydraulic motor concerned, The full speed setting device of the hydraulic motor of the construction equipment according to claim 1 or 2 characterized by having a rotational frequency input means for inputting the set point which sets the rotational frequency of a prime mover independently as a predetermined value.

[Claim 5] A control means is the full speed setting device of the hydraulic motor of the construction equipment according to claim 1 or 2 characterized by choosing the newest command value in those values when two or more command values for setting the tilt angle of the same hydraulic pump or the rotational frequency of the same prime mover as a predetermined value are received.

[Claim 6] A control means is the full speed setting device of the hydraulic motor of the construction equipment according to claim 1 or 2 characterized by choosing the greatest or minimum command value in those values when two or more command values for setting the tilt angle of the same hydraulic pump or the rotational frequency of the same prime mover as a predetermined value are received.

[Claim 7] They are claim 1 characterized by making it output the command value which eased the change concerned when the change more than an allowed value produces the tilt angle of a hydraulic motor or a hydraulic pump, or the rotational frequency of a prime mover in the command value for setting it as a predetermined value after change actuation of a interlocking circuit changing switch or a mode change means thru/or the full speed setting device of the hydraulic motor of any of 6, or the construction equipment of a publication.

[Claim 8] A control means After change actuation of a interlocking circuit changing switch or a mode change means, When the command value inputted into the rate input means, the tilt angle input means, or the rotational frequency input means changes more than the specified quantity, the command value after change actuation Moreover, the full speed setting device of the hydraulic motor of the construction equipment according to claim 1 or 2 characterized by making it output the command value before change actuation as a command value when the inputted command value does not change more than the specified quantity.

[Claim 9] It is the full speed setting device of the hydraulic motor of the construction equipment according to claim 1 or 2 characterized by for a construction equipment being a crane and the inside of a hydraulic motor and at least one being the hydraulic motors for ****** of suspended freight.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention is equipped with a tilt level good transformation hydraulic motor, and the speed-control region is related with the full speed setting device of the hydraulic motor of construction equipments, such as a crane covering a large area, from a low speed to a high speed.
[0002]
[Description of the Prior Art] With a hydraulic crane, the load hung by the main hook and auxiliary hook is moved to a predetermined location, holding the posture, and the activity which unloads calmly is done in many cases, positioning there. In such a case, although the time of unloading or a load needs to begin to lift and it is necessary to hang and take down at slow speed at the time, or to hang, and to lift, it hangs [the / intermediate], and lifts, and hangs, and it is desirable at the time of taking down as prompt as possible to have wound, to wind and to perform taking-down actuation. Generally, although speed control of a hydraulic motor is performed by change actuation of a direction selector valve, it is easy to control, so that the maximum velocity when making a direction selector valve full open is slow, when performing slow-speed control. Then, an operator turns the knob which adjusts the tilt level of a prime-mover rotational frequency, a hydraulic pump, and a hydraulic motor, respectively, and after he sets up so that the maximum velocity of a hydraulic motor may become slow, he is made to perform slow-speed control.
[0003] Since a quick rate is not obtained even if hang [intermediate], and it lifts, and it hangs on the other hand and it makes a direction selector valve full open by this ** at the time of taking down, the above-mentioned knob is turned conversely and high-speed ******** is made to be made. However, such actuation will extend a hand on the knob installed in the control panel etc. by another hand while operating the control lever which changes a direction selector valve by one hand, will operate three knobs, and it also had risk of hanging, having to let a load etc. out of sight, hanging temporarily, and a collision and accident of a load occurring while it was troublesome actuation for the operator.
[0004] Although it succeeds in various ED that this technical problem should be conquered, for example, the revolution lever which an operator always grasps and operates mostly is equipped with a rotating type knob, if rotation actuation of the knob of this revolution lever is carried out at the time of interlocking mode selection, the self-propelled oil pressure crane which could be made to carry out adjustable control of the tilt level of a prime-mover rotational frequency, a hydraulic pump, and a hydraulic motor at coincidence is developed, and practical use is presented.
[0005]
[Problem(s) to be Solved by the Invention] since it degree[of crawling]-winds with the above-mentioned oil-pressure crane and lifts, when winding the degree of crawling from high-speed ******** and the demotion of high-speed **** and performing activity actuation of demotion, only by carrying out rotation actuation of the above-mentioned knob, since three controlled variables of the tilt level of a prime-mover rotational frequency, a hydraulic pump, and a hydraulic motor change to coincidence continuously, it can continue broadly and the maximum velocity of a hydraulic motor can be changed, and a load hangs, and it lifts, and it hangs, and it has become about the operability of a demotion activity with what has improved greatly.

[0006] However, with the above-mentioned conventional technique, by rotation actuation of a knob, since noise damage will be done to a resident if a prime mover carries out high-speed rotation when doing a ****** activity near the residential section at Nighttime or early morning since all the tilt levels of a prime-mover rotational frequency, a hydraulic pump, and a hydraulic motor increase or decrease to coincidence for example, the loading activity of the high speed by selection in interlocking mode cannot be done. Moreover, if the above-mentioned knob is rotated to a high-speed side while performing high-speed ******** actuation when doing the ****** activity of the big load of a load, since the tilt level of a hydraulic motor will become small, the load pressure of a hydraulic motor increases, if a limit with it is exceeded, the pressure regulating valve for the inflow side oil pressure circuit protection of a hydraulic motor with larger load pressure will carry out off, and the discharged oil from a hydraulic pump will not flow into the hydraulic motor, but the hydraulic motor concerned will stop. If it will be in such a condition, since only the hydraulic motor of another side rotates, and one side of a load will be hung quickly and will be lifted, a load will be in a ****** condition, big load pressure is applied also to the hydraulic motor of another side, the hydraulic motor of another side also stops by the same cause as the above, and it may be able to stop being able to hang and lift a load.
[0007] Furthermore, since the change of high-speed - low speed by rotation actuation of a knob cannot make a specific actuator correspond, when you try to make it circle slowly, doing the ****** activity of a high speed, revolution actuation carries out it and it also produces the fault of becoming hot, for example. The full speed of a hydraulic motor can be set up easily broadly, and it can change to the activity mode suitable for work environment or an activity situation easily further, succeeding in this invention that this trouble in the conventional technique should be canceled, and operating the control lever of arbitration, and aims at offering the full speed setting device of the hydraulic motor of the construction equipment which can carry out the activity in alignment with an intention of an operator.
[0008]
[Means for Solving the Problem] By controlling two or more tilt angle adjustment devices which adjust the tilt angle of a hydraulic motor or a hydraulic pump, and the speed governor which adjusts the rotational frequency of a prime mover, and making the tilt angle of a hydraulic motor or a hydraulic pump, or the rotational frequency of a prime mover set it as a predetermined value, in order that this invention may solve the above-mentioned technical problem The interlocking circuit changing switch for changing interlocking actuation and actuation in which it does not interlock, near the grip section of two or more control levers, while having the control means which sets up the full speed of a hydraulic motor, When this interlocking circuit changing switch is changed to a linkage side, by actuation of the control lever concerned what arranged the rate input means for inputting the command value which adjusts the rotational frequency of the prime mover which drives the tilt angle of the hydraulic motor by which motion control is carried out, the tilt angle of the hydraulic pump which supplies hydraulic oil to the hydraulic motor concerned, and/or the hydraulic pump concerned to coincidence, respectively -- or While arranging said interlocking circuit changing switch and said rate input means near the grip section of at least one control lever In the location of arbitration 3 linkage mode in which the rotational frequency of the prime mover which drives the tilt angle of the hydraulic motor in which motion control is carried out by actuation of the control lever concerned when a interlocking circuit changing switch is changed to a linkage side, the tilt angle of the hydraulic pump which supplies hydraulic oil to the hydraulic motor concerned, and the hydraulic pump concerned can be adjusted to coincidence, The mode change means for changing at least two modes with 2 linkage mode in which either the tilt angle of the hydraulic motor concerned, the tilt angle of the hydraulic pump concerned or the rotational frequency of the prime mover concerned can be adjusted to coincidence is arranged.
[0009] Moreover, it has preferably two or more hydraulic pumps driven on a prime mover. A rate input means is a tilt angle input means for inputting the set point which sets the tilt angle of the hydraulic pump which supplies hydraulic oil as a predetermined value into the hydraulic motor in which motion control is carried out by actuation of a control lever. Make it set as a predetermined value by coincidence, respectively, or the rotational frequency of the prime mover which drives the tilt angle and/or the hydraulic pump concerned of the hydraulic motor with which this hydraulic

pump supplies hydraulic oil with the tilt angle of a hydraulic pump by inputting the set point into this tilt angle input means When two or more command values for setting the tilt angle of the same hydraulic pump or the rotational frequency of the same prime mover as a predetermined value are received, a control means The newest command value or the newest, the greatest or minimum command value is chosen in those values. When the change more than an allowed value produces the tilt angle of a hydraulic motor or a hydraulic pump, or the rotational frequency of a prime mover in the command value for setting it as a predetermined value after change actuation of a interlocking circuit changing switch or a mode change means It is made to output the command value which eased the change concerned. Further a control means After change actuation of a interlocking circuit changing switch or a mode change means, When the command value into which the command value after change actuation was inputted again when the command value inputted into the rate input means, the tilt angle input means, or the rotational frequency input means changed more than the specified quantity does not change more than the specified quantity, it is made to output the command value before change actuation as a command value.

[0010]

[Embodiment of the Invention] Hereafter, one example of this invention is explained to a detail with reference to a drawing. Drawing 1 , drawing 2 , and drawing 3 are the main oil pressure circuit diagram of the oil pressure crane concerning the example of this invention, the front view of a control unit, and a side elevation, respectively. The prime mover which is the driving source of the oil pressure crane which 1 does not illustrate in these drawings, The speed governor with which 2 controls the engine speed of a prime mover 1, and 3 follow the actuation input of the circuit changing switch and knob which an operator mentions later. The engine speed of a prime mover 1, The sub****** main hydraulic pump which is the hydraulic oil source of supply which the control device which carries out adjustable control of the tilt angle of the hydraulic pump mentioned later or a hydraulic motor, and 4 and 5 are connected with a prime mover 1, they rotate, and supplies hydraulic oil to an actuator, and 6 are oil tanks which store hydraulic oil.

[0011] Moreover, the boom-hoisting direction selector valve supplied to the hydraulic motor for boom hoisting which 10 changes the direction and flow rate of hydraulic oil which were breathed out from the hydraulic pump 4 according to actuation of an operator, and is mentioned later, The control lever for boom hoisting for 11 to change and operate this boom-hoisting direction selector valve 10, The hydraulic motor for boom hoisting for 12 to make the boom of an oil pressure crane rise and fall, The tilt angle adjustment machine with which 13 adjusts the tilt angle of the hydraulic motor 12 for boom hoisting, the drum for boom hoisting of the boom which 14 does not illustrate, 20-24 are the signs which showed the same component concerning an auxiliary ****** machine. 20 the control lever for auxiliary ******, and 22 for the auxiliary ****** direction selector valve and 21 The hydraulic motor for auxiliary ******, The tilt angle adjustment machine of the hydraulic motor 22 for auxiliary ****** and 24 23 The drum for auxiliary ****** machines, Furthermore, 30-34 are the signs which showed the same component concerning the main ****** machine, and, for the ****** direction selector valve and 31, as for the hydraulic motor for the main ******, and 33, the control lever for the main ****** and 32 are [30 / the tilt angle adjustment machine of the hydraulic motor 32 for the main ****** and 34] the drums for the main ****** machines.

[0012] Moreover, 15, 16, and 17 are arranged in the crowning, the head, and the attachment section of the control lever 11 for boom hoisting, respectively. Linkage of the rotation command value of the knob for a tilt angle setup of the tilt angle adjustment machine 41 of the subhydraulic pump 4, and a knob 15, The mode circuit changing switch for performing the mode change at the time of choosing the interlocking circuit changing switch and interlocking mode for changing un-interlocking, 25, 26, 27, and 35, 36 and 37, respectively The crowning of the control lever 21 for auxiliary ******, and the control lever 31 for the main ******, It is the actuation input means arranged in a head and the attachment section, and is the knob, each interlocking circuit changing switch, and mode circuit changing switch for a tilt angle setup of the tilt angle adjustment machine 41 of the subhydraulic pump 4, and the tilt angle adjustment machine 51 of the main hydraulic pump 5.

[0013] 18, 28, and 38 are arranged by guide-peg Motobe of the control lever 11 for boom hoisting, the control lever 21 for auxiliary ******, and the control lever 31 for the main ******, respectively. Respectively The tilt angle setting knob of the hydraulic motor 12 for boom hoisting, the hydraulic

motor 22 for auxiliary ******, and the hydraulic motor 32 for the main ******, A prime-mover rotational frequency setting knob for 19 to set up the rotational frequency of a prime mover 1, and 41 and 51, respectively The tilt angle adjustment machine of the sub****** main hydraulic pumps 4 and 5, 42 and 52 are pressure regulating valves which will carry out off if a limit with the oil pressure in the outflow by-pass way of the sub****** main hydraulic pumps 4 and 5 is exceeded, and protect the hydraulic circuit concerned from excessive **, respectively.

[0014] The sub****** main hydraulic pumps 4 and 5, and the hydraulic motor 12 for boom hoisting, the hydraulic motor 22 for auxiliary ****** and the hydraulic motor 32 for the main ****** are the things of discharge quantity good transformation altogether, and it consists of this examples. The hydraulic motor 12 for boom hoisting and the hydraulic motor 22 for auxiliary ****** are driven with the hydraulic oil which series connection is carried out through the boom-hoisting direction selector valve 10 and the auxiliary ****** direction selector valve 20, and is supplied from the subhydraulic pump 4. The hydraulic motor 32 for the main ****** is constituted so that it may drive with the hydraulic oil independently supplied from the main hydraulic pump 5. Moreover, knobs 15, 18, 19, 25, 28, 35, and 38 are connected with the variable resistor, the electrical-potential-difference value of those load resistance is detected, the interlocking circuit changing switches 16, 26, and 36 are 2 contact circuit changing switches, and the mode circuit changing switches 17, 27, and 37 consist of toggle-type 3 contact circuit changing switches, respectively. In addition, although the hydraulic circuit for driving the hydraulic motor for transit and the hydraulic motor for revolution exists out of the hydraulic circuit shown in drawing 1 , since it is unrelated to the summary of this invention, illustration and explanation are omitted.

[0015] When the interlocking circuit changing switches 16, 26, and 36 are changed to a linkage side, the command signal according to the amount of actuation rotation of knobs 15, 25, and 35 is inputted into a control device 3, and the output command value in the mode according to the change location of the mode circuit changing switches 17, 27, and 37 calculates in a control device 3. The calculated output command value is outputted to at least two in the corresponding group of a speed governor 2, the tilt angle adjustment machines 41 and 51 of the sub****** main hydraulic pumps 4 and 5, and the tilt angle adjustment machines 13, 23, and 33 of the hydraulic motor 12 for boom hoisting, the hydraulic motor 22 for auxiliary ******, and the hydraulic motor 32 for the main ******. On the other hand, when the interlocking circuit changing switches 16, 26, and 36 are changed to an un-interlocking side, the command signal from the knobs 15, 25, and 35 for a tilt angle setup of a pump functions only as an object for a tilt angle setup of the sub****** main process pumps 4 and 5 corresponding to each control levers 11, 21, and 31, and the output command value according to a command signal is outputted to the tilt angle adjustment machines 41 and 51, respectively.

[0016] On the other hand, the output command value according to the command signal from the knobs 18, 28, and 38 for a tilt angle setup of a motor and the knob 19 for a prime-mover rotational frequency setup is outputted to the tilt angle adjustment machines 13, 23, and 33 and a speed governor 2, respectively. Each tilt angle and rotational frequency are set up with these output command values, and the maximum rotational speed of the hydraulic motor 12 for boom hoisting, the hydraulic motor 22 for the main ******, and the hydraulic motor 32 for auxiliary ****** is determined. Since the command signal for setting up the tilt angle of one subhydraulic pump 4 from both the knobs 15 and 25 of each control levers 11 and 21 is outputted, a control unit 3 chooses one of command signals by the newest value selection processing mentioned later, and outputs them to the tilt angle adjustment machine 41 of the subhydraulic pump 4 as an output command value.

[0017] While an operator operates one in each control levers 11, 21, and 31, or two and performing one or two change actuation in the above-mentioned interlocking circuit changing switches 16, 26, and 36 and the mode circuit changing switches 17, 27, and 37 Construction works, such as loading and ******, are smoothly executable efficiently by performing rotation actuation of knobs 15, 25, and 35 or knobs 18, 19, 28, and 38, and setting up suitably the maximum rotational speed of the desired hydraulic motors 12, 22, and 32. In addition, although not shown in drawing 1 , when an overload acts on the hydraulic motors 12, 22, and 32 concerned in the drive circuit of the above-mentioned hydraulic motors 12, 22, and 32, the excessive load protection network which prevents that increase a tilt angle automatically and an excessive load is applied to the sub****** main hydraulic pumps 4 and 5 is added. Moreover, although it has the composition that the two sub******

main hydraulic pumps 4 and 5 were connected with the prime mover 1, and series connection of the hydraulic motor 12 for boom hoisting and the hydraulic motor 22 for auxiliary ****** was carried out to the outflow side cut way of the subhydraulic pump 4 through the boom-hoisting direction selector valve 10 and the auxiliary ****** direction selector valve 20, in this example, it may not pass over this to an example, but one or three or more are sufficient as a hydraulic pump, and a hydraulic motor may be the configuration by which parallel connection was carried out.
[0018] Next, actuation of this example is explained. as mentioned above -- this example -- all control levers -- that is Since the knobs 15, 25, and 35 for a tilt angle setup of the interlocking circuit changing switches 16, 26, and 36 and the sub****** main hydraulic pumps 4 and 5 are formed in the control lever 11 for boom hoisting, the control lever 21 for auxiliary ******, and the control lever 31 for the main ******, respectively, for example While choosing the mode in which it does not interlock and operating one in the three above-mentioned control levers 11, 21, and 31, or two To change to interlocking mode and change greatly the full speed of the hydraulic motors 12, 22, and 32 concerned By carrying out rotation actuation of the knobs 15, 25, and 35, while changing to a linkage side any of each interlocking circuit changing switch 16, 26, and 36 they are, without releasing one's hold of the The full speed of the hydraulic motors 12, 22, and 32 concerned can be continuously changed easily to a minimum prompt maximum high speed.
[0019] Drawing 4 is a signal-processing schematic diagram showing the signal-processing network according to rotation actuation of the knobs 19, 35, and 38 when changing and operating the interlocking circuit changing switch 36 and the mode circuit changing switch 37, while operating the control lever 31 for the main ******. In addition, signal processing in a knob actuation detecting element, ********, etc. in the main **** mode change signal processing which are described below is equivalent to signal processing based on the program performed with a control unit 3. For example, when a load tends to be hung at high speed, and tends to be lifted and it is going to carry out it Although move the interlocking circuit changing switch 36 to the bottom, change to interlocking mode, the mode circuit changing switch 37 is further moved to the bottom, it changes to a mode and an efficient ****** activity is done while an operator operates the control lever 31 for the main ****** When an activity attains to even Nighttime and it unloads a heavy load In order to make it not emit the noise, the rotational frequency of a prime mover 1 must be dropped, and moreover, since an excessive load protection network is not operated, the tilt angle of assistance and the hydraulic motors 22 and 32 for the main ****** cannot be made not much small. For this reason, an operator moves the interlocking circuit changing switch 36 to the bottom, and changes to the mode in which it does not interlock. Thereby, the mode change signal MCM showing "un-interlocking" is outputted to the main signal change sections SCM1 and SCM2, the main motor **** property storage section TMM, the main process pump **** property storage section TPM, the prime-mover rotation property storage section TEM and the main motor data storage section MMM, the main process pump data storage section PMM, and the prime-mover data storage section EMM.
[0020] In the main signal change sections SCM1 and SCM2, an internal circuit changing switch is changed to an un-interlocking I side by the mode spawn process by this mode change signal MCM, respectively, and the **** property table corresponding to un-interlocking (d mode) is read, respectively in the main motor **** property storage section TMM, the main process pump **** property storage section TPM, and the prime-mover rotation property storage section TEM. And the main motor data storage section MMM, the main process pump data storage section PMM, In the prime-mover data storage section EMM, respectively The motor tilt level operation value before a mode change, namely, motor tilt level operation value QMMb corresponding to the amount of rotation of a knob 38 Motor tilt level operation value QMMa after a mode change pump tilt level operation value QPMb corresponding to [similarly] the pump tilt level operation value of rotation before a mode change, i.e., the amount of a knob 35, Pump tilt level operation value QPMa after a mode change Furthermore, the prime-mover rotational frequency operation value before a mode change, i.e., the prime-mover rotational frequency operation value NMb corresponding to the amount of rotation of a knob 19 and the prime-mover rotational frequency operation value NMa after a mode change, It memorizes.
[0021] Drawing 5 is the **** property Fig. showing an example of the main motor **** property (a) over the amount of knob rotation, a main process pump **** property (b), and a prime-mover

rotation property (c). In these drawings, a thick wire expresses the mode in which it does not interlock and a thin line expresses the property at the time of interlocking a mode selection. Since each knobs 19, 35, and 38 function independently as a tilt level or an object for a rotational frequency setup in the mode (d mode) in which it does not interlock, respectively, in order to make a control area large, the **** property slope of a line is loose. On the other hand, if it pinches in the interlocking a mode and 35 is rotated, it will become having operated other knobs 19 and 38 to coincidence, and an EQC. Since it fluctuates quickly, the maximum engine speed of the hydraulic motor 32 for the main ****** so that the change may become a little loose in a crawling region and a high-speed region The flat part is prepared in the crawling region of the main motor **** property straight line and the high-speed region, the high-speed region of a main process pump **** property straight line, and the crawling region of a prime-mover rotation property straight line. That is, it pinches in a crawling region and a high-speed region, and to rotation change of 35, it fluctuates primary or in quadratic function, and the maximum engine speed of the hydraulic motor 32 for the main ****** is quickly fluctuated in cubic function by the middle-speed range. Thereby, shift setting actuation between a crawling region and a high-speed region can be performed promptly, securing the operability of maximum-engine-speed setting actuation of the hydraulic motor 32 for the main ****** in a crawling region.

[0022] By the way, there is a possibility that the command value for determining a tilt level by it based on a **** property table if activity mode is changed by change actuation of the interlocking circuit changing switch 36 and the mode circuit changing switch 37 may change nonsequetially. It is very dangerous if a prime mover 1 and hydraulic motors 12, 22, and 32 begin high-speed rotation suddenly by this. So, in this example, after change actuation of the interlocking circuit changing switch 36 is carried out, when it judges whether the corresponding knob was operated by the knob actuation detecting element DOD and it is not operated, it is made to perform change insurance processing which maintains the command value of the knob concerned at the value before a mode change.

[0023] That is, a control device 3 is motor tilt level operation value QMMa+1 immediately after a mode change and after program 1 period deltaT, QMMa, pump tilt level operation value QPMa+1, and QPMa, respectively from the main motor data storage section MMM, the main process pump data storage section PMM, and the prime-mover data storage section EMM. And prime-mover rotational frequency operation value NMa+1 and NMa While reading |QMMa+1-QMMa |> TMM .... (1)

It judges whether it is satisfied. It is judged as that by which the knob 35 or the knob 38 was operated when the judgment result was ****, the main signal change section SCM 3 is changed to the backside [a change] a, and it is QMM=QMMa. By outputting, if the judgment result is no, a knob 35 or a knob 38 will be judged to be what was not operated, and the main signal change section SCM 3 will be changed to a before [a change] b side, and it is QMM=QMMb. It outputs.

[0024] To this appearance |QPMa+1-QPMa |>TPM .... (2) It reaches. |NMa+1-NMa |> TNM .. (3) It judges whether it is satisfied. If each judgment result is ****, it will be judged as that by which the knob 35 or the knob 38 was operated. The main signal change sections SCM4 and SCM5 are changed to the backside [a change] a, respectively, and they are QPM=QPMa and NM=NMa. Output, and if each judgment result is no It is judged as what was not operated, the main signal change sections SCM4 and SCM5 are changed to a before [a change] b side, respectively, and a knob 35 or a knob 38 is QPM=QPMb and NM=NMb. It outputs. Thus, the command value after a mode change is outputted only to the adjustment machines (speed governor) 2, 33, and 51 with which a command value is outputted from the operated knob by passing through mode change insurance processing. Therefore, it can prevent that the command value over the adjustment machines (speed governor) 2, 33, and 51 changes nonsequetially mechanically, and the hydraulic motor 32 for the main ****** hangs up by change actuation of interlocking circuit changing switch 36 grade.

[0025] As mentioned above, in this example, while changing the interlocking circuit changing switch 36 to interlocking mode, two or more interlocking modes can be chosen by changing and operating the mode circuit changing switch 37. The contents in two or more interlocking modes are explained below.

[0026] (i) When [both] the a mode a mode is chosen, the circuit changing switch of the main signal change section SCM 1 and the SCM2 interior is changed to Linkage C side by the mode change signal MCM, respectively, and, as for the rotation command value of a knob 35, the function as the tilt level command value of the hydraulic motor 32 for the main ****** and a rotational frequency command value of a prime mover 1 is achieved only as a tilt level command value of the main hydraulic pump 5.
[0027] That is, it pinches at the time of interlocking a mode selection, 19 and the rotation command value of 38 are disregarded, and the rotation command value of a knob 35 functions only as a command value for a pump tilt level setup also as the command value for a motor tilt level setup, and a command value for a prime-mover rotational frequency setup. Therefore, if a knob 35 is rotated, three tilt level command values, the motor tilt level QMM, the pump tilt level QPM, and the prime-mover rotational frequency NM, will interlock, and it will change. Since the full speed setting region of the hydraulic motor 32 for the main ****** which is pinched and can be controlled in a mode by rotation actuation of 35 is large, it is suitable when [which repeats a high-speed activity or this activity that changes conversely, and performs it suddenly from a low-speed activity] doing the loading activity of many loads of a light load a little.
[0028] (ii) When the b mode b mode is chosen, only the circuit changing switch of the main signal change section SCM2 interior is changed to Linkage C side by the mode change signal MCM, and the rotation command value of a knob 35 achieves the function as a rotational frequency command value of a prime mover 1 only as a tilt level command value of the main hydraulic pump 5. Therefore, if a knob 35 is rotated, two input command values, the pump tilt level QPM and the prime-mover rotational frequency NM, will interlock, and it will change. On the other hand, the motor tilt level QMM is pinched and is set up according to the rotation command value of 38.
[0029] For example, in order to carry out high-speed ****** of the suspended freight in a mode, when a knob 35 is turned greatly and the motor tilt level QMM becomes minute When doing the loading activity of the load of heavy loading, and the alignment lifting-and-holding activity which carries out the lifting and holding of the one suspended freight with two ropes especially Since the tilt level of the hydraulic motor which rolls and lifts the rope concerned will be compulsorily increased by actuation of a pump protection network if an over load is applied to one rope, the fault that the speed difference will arise on two ropes and suspended freight will incline occurs. However, in b mode, the motor tilt level QMM is set up independently by rotation actuation of the knob 38 arranged at feet of the control lever 31 for the main ******, and since it is not influenced by rotation actuation of the knob 35 for a interlocking command, but it pinches to it and it is decided only with the amount of rotation of 38, it can avoid generating of above-mentioned fault.
[0030] (iii) When the c mode c mode is chosen, only the circuit changing switch of the main signal change section SCM1 interior is changed to Linkage C side by the mode change signal MCM, and the rotation command value of a knob 35 achieves the function as a tilt level command value of the hydraulic motor 32 for the main ****** only as a tilt level command value of the main hydraulic pump 5. Therefore, if a knob 35 is rotated, two tilt level command values, the motor tilt level QMM and the pump tilt level QPM, will interlock, and it will change. On the other hand, the prime-mover rotational frequency NM is pinched and is set up according to the rotation command value of 19. If high-speed ****** operation is performed in a mode or b mode near Nighttime or the residential section, the prime-mover rotational frequency NM becomes large, and the noise will be made and it will become a nuisance to the neighbors. In such a case, as useful activity mode, the prime-mover rotational frequency NM does not change, but c mode which became independent depending on rotation actuation of the knob 35 for a interlocking command and which pinches and is decided only by rotation actuation of 19 is set up.
[0031] (iv) In d mode this example, the mode in which pinch and the rotation command value of 35 does not function as a rotation command value of other knobs and in which it does not interlock is called d mode. Therefore, d mode is chosen not by the change actuation by the mode circuit changing switch 37 but by the change actuation by the interlocking circuit changing switch 36. As mentioned above, although the main **** mode change signal processing which sets up the full speed of the hydraulic motor 32 for the main ****** was explained, it is carried out completely similarly about auxiliary **** mode change signal processing and boom-hoisting mode change

signal processing, and the motor tilt levels QMA and QMB, the pump tilt levels QPA and QPB, and the prime-mover rotational frequencies NA and NB are determined and outputted through a mode spawn process and mode change insurance processing, respectively.

[0032] As mentioned above, while arranging the interlocking circuit changing switches 16, 26, and 36 in each control levers 11, 21, and 31 in this example, the mode circuit changing switches 17, 27, and 37 are put side by side. As interlocking mode, the motor tilt levels QMM, QMA, and QMB, the pump tilt levels QPM, QPA, and QPB, and the prime-mover rotational frequencies NM, NA, and NB besides a mode which can carry out coincidence change b mode in which coincidence change only of the pump tilt levels QPM, QPA, and QPB and the prime-mover rotational frequencies NM, NA, and NB can be carried out, Since it enabled it to choose c mode in which coincidence change only of the motor tilt levels QMM, QMA, and QMB and the pump tilt levels QPM, QPA, and QPB can be carried out Since the interlocking activity mode of having been suitable for the work content and work environment at that time can be chosen like when working near the case where an alignment lifting-and-holding activity is done, night, or the residential section, the activity in alignment with an intention of an operator is executable. And since the change in interlocking mode and the mode in which it does not interlock, and the change in the activity mode in interlocking mode can be easily performed even if they are operating what control levers 11, 21, and 31, they are what was extremely excellent in operability for the operator.

[0033] By the way, since the two sub****** main hydraulic pumps 4 and 5 are driven by one prime mover 1 in this example and the subhydraulic pump 4 has the composition of rotating two hydraulic motors 12 for boom hoisting, and hydraulic motors 22 for auxiliary ****** The command value for setting up the rotational frequency N of the speed governor 2 which the command value for setting up the tilt angle QP of the tilt angle adjustment machine 41 of the subhydraulic pump 4 has two pump tilt levels QPA and QPB, and controls the rotational frequency of a prime mover 1 has three prime-mover rotational frequencies NM, NA, and NB. Then, a control unit 3 performs command value selection processing which chooses the optimal thing in these command values that compete.

[0034] Drawing 6 is a signal-processing schematic diagram showing the signal-processing network of the newest value selection processing performed by continuing at mode change signal processing about each control levers 11, 21, and 31, and ******. As shown in this drawing, although it is outputted to the tilt angle adjustment machine 33 of the hydraulic motor 32 for the main ******, and the tilt angle adjustment machine 51 of the main hydraulic pump 5, respectively after the motor tilt level QMM and the pump tilt level QPM which were outputted through the main **** mode change signal processing shown in drawing 5 receive ****** by ******** SD, the prime-mover rotational frequency NM is outputted to the newest value selection section LTC2. Similarly, although the motor tilt levels QMA and QMB outputted through auxiliary **** mode change signal processing and boom-hoisting mode change signal processing are outputted to the tilt angle adjustment machines 23 and 13 of the hydraulic motor 22 for auxiliary ******, and the hydraulic motor 12 for boom hoisting, respectively after they receive ****** by ******** SD, the pump tilt levels QPA and QPB are outputted to the newest value selection section LTC1, and the prime-mover rotational frequencies NA and NB are outputted to the newest value selection section LTC2.

[0035] In the newest value selection section LTC1 and the newest value selection section LTC2, the stored data of the subpump data storage sections PMA and PMB and the prime-mover data storage sections EMA and EMB is investigated, respectively. Any or a new thing is chosen as a pump tilt level QP of the subhydraulic pump 4 in the pump tilt levels QPA and QPB. Moreover, in the prime-mover rotational frequencies NM, NA, and NB, after any or a new thing is chosen as a prime-mover rotational frequency N and receives ****** by ******** SD, it is outputted to the speed governor 2 of the tilt angle adjustment machine 41 of the subhydraulic pump 4, and a prime mover 1, respectively.

[0036] Thus, even if two objects for boom hoisting and the hydraulic motors 12 and 22 for auxiliary ****** have composition which drives to one subhydraulic pump 4, and the two more Lords and the subhydraulic pumps 5 and 4 drive on one prime mover in this example The corresponding interlocking circuit changing switch 26 prepared in the upper part, operating the thing 21 of arbitration, for example, the control lever for auxiliary ******, in each control levers 11, 21, and 31 for example The change of the interlocking circuit changing switches 16 and 36 and knobs 15 and 35

which were formed in other control levers 11 and 31 by pinching while changing to the "linkage" side, and carrying out rotation actuation of 25, and a rotation condition are not [how] scrupulous, and the command value based on the newest actuation is chosen. According to them, the tilt level of the subhydraulic pump 4 and the rotational frequency of a prime mover 1 are determined uniquely.
[0037] That is, since desired full speed can be set up while choosing desired activity mode, without releasing one's hold of the control lever concerning the activity which is carrying out current activation For example, after lifting calmly, holding the posture of suspended freight by the alignment lifting-and-holding activity, It can wind quickly and can lift, or ** holding the control lever for activity execution of actuation of laying calmly the suspended freight which hung suddenly and was taken down on a loading platform, and the working-speed region of an actuator can be set as the range of desired, and can be performed with a promptly and sufficient precision.
[0038] In addition, when choosing the greatest thing when thinking high-speed operation as important, or thinking as important the case where a crawling activity is mainly done, and safety, you may make it choose the minimum thing, although the newest thing was chosen for the command value of a pump tilt level or a prime-mover rotational frequency which a control unit 3 chooses and outputs in this example.
[0039] Next, ****** in ******** SD performed at the last of signal processing performed with a control unit 3 is explained. As mentioned above, although only the rotation command value of the knob operated after the mode change by mode change insurance processing is outputted as a command value after a mode change, the command value outputted to the speed governor 2 of a prime mover 1, or the tilt angle adjustment machines 51 and 41 of the Lord and the subhydraulic pumps 5 and 4 The command value after the newly set-up mode change may change from the command value before a mode change nonsequetially, and there is a possibility of being in dangerous conditions, like a load shake arising in that case. Then, when an input command value has nonsequential change so that nonsequential change may not arise in an output command value, he gives ****** which makes the change loose, and is trying to prevent generating of the above-mentioned fault in this example. The case where nonsequential change arises in the prime-mover rotational frequency N outputted to ******** SD for example, through the newest value selection processing as an example is explained. The input prime-mover rotational frequency after Nb and a mode change for the input prime-mover rotational frequency before a mode change Na I, If maximum-permissible variation after program 1 period deltaT of Na+i O and a prime-mover rotational frequency is set to deltaN, the output prime-mover rotational frequency after the program i period after a mode change If it is Na I-Na+i-1 O >=deltaN Na+i O =Na+i-1 O+deltaN However, Na0 O=Nb ;
If it is 0<Na I-Na+i-1 O <deltaN Na+i O =Na I ;
If it is Na I-Na+i-1 O <=-deltaN Na+i O =Na+i-1 O-deltaN;
If it is 0>Na I-Na+i-1 O >-deltaN Na+i O =Na I .... (4)
It carries out.
[0040] Drawing 7 is the chronogram showing time amount progress of one example of the input value and output value of the control unit 3 of the prime-mover rotational frequency N. by this example, the mode changes by t= 0 -- having -- an input prime-mover rotational frequency -- Nb from -- Na I It changes. furthermore, an input prime-mover rotational frequency -- Na0I It changes to Na11 (Na11-Na0I > TN). from -- time-of-day t=t1 an input prime-mover rotational frequency -- Na11 from -- Na2I Output prime-mover rotational frequency Na+i O for every program period at the time of changing Time amount progress is shown later on. mode change insurance processing -- [Na11-Na0I >TN] -- an input prime-mover rotational frequency -- Nb from -- Na I changing -- further -- Na I-Na0 Since it is O>=delta N, it is set to Na1 O=Nb+deltaN. And Na I-Na1 Since it is O>=delta N, it is output prime-mover rotational frequency Na+i O like Na2 O=Nb+2deltaN. It goes up stair-like and is time-of-day t=t1. Input prime-mover rotational frequency Na 11 Since it decreased rapidly, it is descending stair-like.
[0041] Thus, input prime-mover rotational frequency Na 1 When it changes nonsequetially or rapidly at the time of a mode change etc., it is the output prime-mover rotational frequency Na O by above-mentioned ******. Since the output value is eased so that it may change gently, it can prevent that risk, such as a load shake, arises by the abrupt change of the command value outputted to a

speed governor 2 or the tilt angle adjustment machines 41 and 51.
[0042] In addition, although the knobs 15, 25, and 35 for a tilt angle setup of the sub****** main hydraulic pumps 4 and 5 were put in this example as a command markup force means of the tilt angle at the time of interlocking mode selection, and a rotational frequency This is because b mode and c mode were also chosen out of a mode, and be [easy as long as / it] it can choose only c mode out of a mode, it may apply the knobs 18, 28, and 38 for a tilt angle setup of each hydraulic motors 12, 22, and 32 as the above-mentioned command markup force means. Moreover, although knobs 18, 28, and 38 were prepared for guide-peg Motobe of each control levers 11, 21, and 31, you may prepare in the upper part of each control levers 11, 21, and 31, and may arrange on the control panel which is not illustrated.
[0043]
[Effect of the Invention] The interlocking circuit changing switch for changing interlocking actuation and actuation in which it does not interlock, near the grip section of two or more control levers according to invention according to claim 1, as explained above, Since the rate input means for inputting the command value which adjusts the tilt angle of the hydraulic motor in which motion control is carried out by actuation of the control lever concerned, the tilt angle of the hydraulic pump concerned, and/or the rotational frequency of the prime mover concerned to coincidence was arranged, respectively when interlocking mode was chosen Since the command value which changes a command input to linkage and un-interlocking, and adjusts each tilt angle of a hydraulic motor and a hydraulic pump or the rotational frequency of the prime mover concerned to coincidence can be inputted even if it is working by operating what control lever Without lifting a hand from the control lever under actuation, the full speed of a hydraulic motor can be easily set as a large area from a low speed to a high speed, it can improve sharply and, moreover, operability can be easily changed to the activity mode suitable for an activity situation.
[0044] While arranging a interlocking circuit changing switch and a rate input means near the grip section of at least one control lever according to invention according to claim 2 3 linkage mode in which the tilt angle of the hydraulic motor in which motion control is carried out by actuation of the control lever concerned when it changes to a interlocking circuit changing switch's linkage side with the location of arbitration, and the hydraulic pump concerned, and the rotational frequency of the prime mover concerned can be adjusted to coincidence, Since the mode change means for changing at least two modes with 2 linkage mode in which either the tilt angle of the hydraulic motor and the hydraulic pump concerned concerned or the rotational frequency of the prime mover concerned can be adjusted to coincidence was arranged Since the activity mode which the work environment of not only an activity that sets the full speed of a hydraulic motor as a large area from a low speed to a high speed but night, a residential section, etc., or the suspended freight of heavy loading hung, lifted, and was suitable for work contents, such as an activity, can be chosen, the activity in alignment with an intention of an operator is executable.
[0045] According to invention according to claim 3, a rate input means is a tilt angle input means for inputting the set point which sets the tilt angle of the hydraulic pump in which oil quantity control is carried out by actuation of the control lever under actuation as a predetermined value. Since coincidence set the rotational frequency of the prime mover which drives the tilt angle and/or the hydraulic pump concerned of the hydraulic motor with which this hydraulic pump supplies hydraulic oil as the predetermined value by inputting the set point into this tilt angle input means, respectively Since the interlocking mode in which the tilt angle of a hydraulic motor and the rotational frequency of a prime mover can be set up independently can be set up, the activity mode suitable for work environment or a work content can be set up. According to invention according to claim 5, when two or more command values for setting the tilt angle of the same hydraulic pump or the rotational frequency of the same prime mover as a predetermined value are received, a control means In those values, since the newest command value was chosen and the tilt angle of a hydraulic pump and the rotational frequency of a prime mover are set up according to the command value from the input means currently operated till then, the command value nearest to an intention of an operator can be chosen.
[0046] Since according to invention according to claim 6 the control means chose the greatest or minimum command value in those values when two or more command values for setting the tilt

angle of the same hydraulic pump or the rotational frequency of the same prime mover as a predetermined value were received, when a high-speed activity or a low-speed activity has many work contents, the tilt angle of the hydraulic pump suitable for it and the rotational frequency of a prime mover can be set up. According to invention according to claim 7, after interlocking change actuation or mode change actuation, since it was made to output the command value which eased the change concerned when the change more than an allowed value produced the tilt angle of a hydraulic motor or a hydraulic pump, or the rotational frequency of a prime mover in the command value for setting it as a predetermined value, it can prevent that risk, such as a load shake, a steep turn, etc. by sudden rotation of a hydraulic motor, arises.

[0047] According to invention according to claim 8, after interlocking change actuation or mode change actuation, When the command value inputted into the rate input means, the tilt angle input means, or the rotational frequency input means changes more than the specified quantity, the command value after change actuation Moreover, since it was made to output the command value before change actuation as a command value when the inputted command value did not change more than the specified quantity, generating of risk of being because rotation of a hydraulic motor changing with the command values from the input means which an operator does not operate rapidly can be prevented.

[Translation done.]

* NOTICES *

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3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The main oil pressure circuit diagram of the oil pressure crane concerning the example of this invention
[Drawing 2] Similarly, it is the front view of the control unit of an oil pressure crane.
[Drawing 3] Similarly, it is the side elevation.
[Drawing 4] The signal-processing schematic diagram according to rotation actuation of the knob when changing and operating a interlocking circuit changing switch and a mode circuit changing switch
[Drawing 5] The **** property Fig. showing an example of the main motor **** property (a) over the amount of knob rotation, a main process pump **** property (b), and a prime-mover rotation property (c)
[Drawing 6] The signal-processing schematic diagram showing the signal-processing network of the newest value selection processing and ******
[Drawing 7] Chronogram showing time amount progress of one example of the input value and output value of the control unit of a prime-mover rotational frequency
[Description of Notations]
1 Prime Mover
2 Speed Governor
3 Control Unit
4 Five Hydraulic pump
10, 20, 30 Direction selector valve
11, 21, 31 Control lever
12, 22, 32 Hydraulic motor
13, 23, 33, 41, 51 Tilt angle adjustment machine
14, 24, 34 Drum
15, 18, 19, 25, 28, 35, 38 Knob
16, 26, 36 Interlocking circuit changing switch
17, 27, 37 Mode circuit changing switch
42 52 Pressure regulating valve

[Translation done.]

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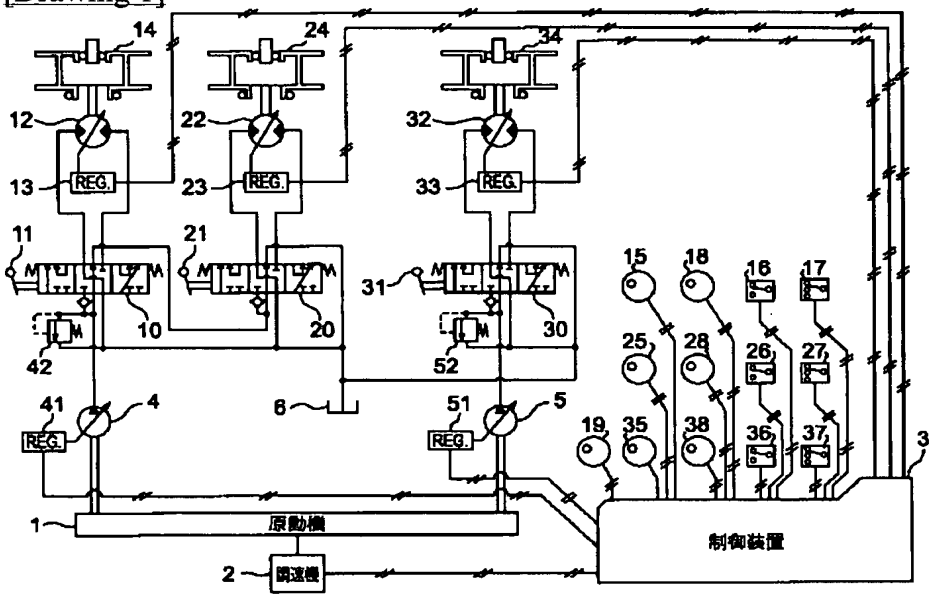
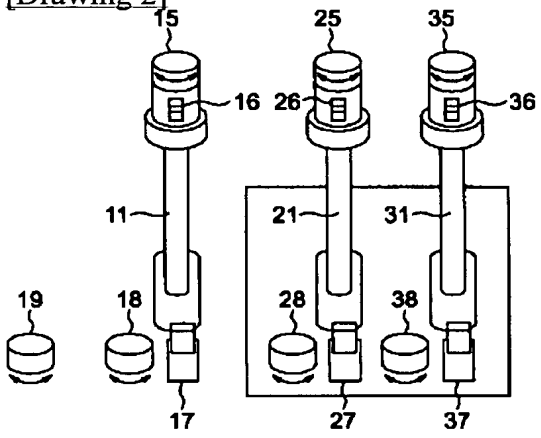
3.In the drawings, any words are not translated.

DRAWINGS

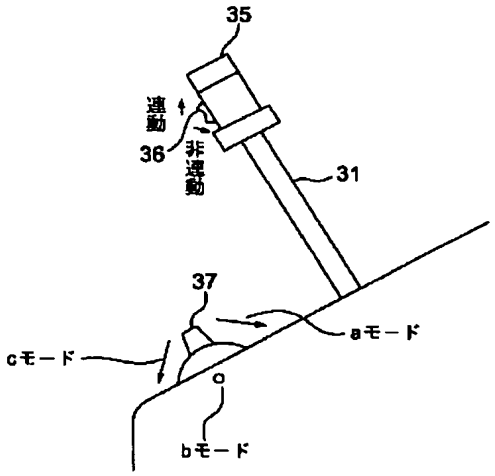
[Drawing 1]



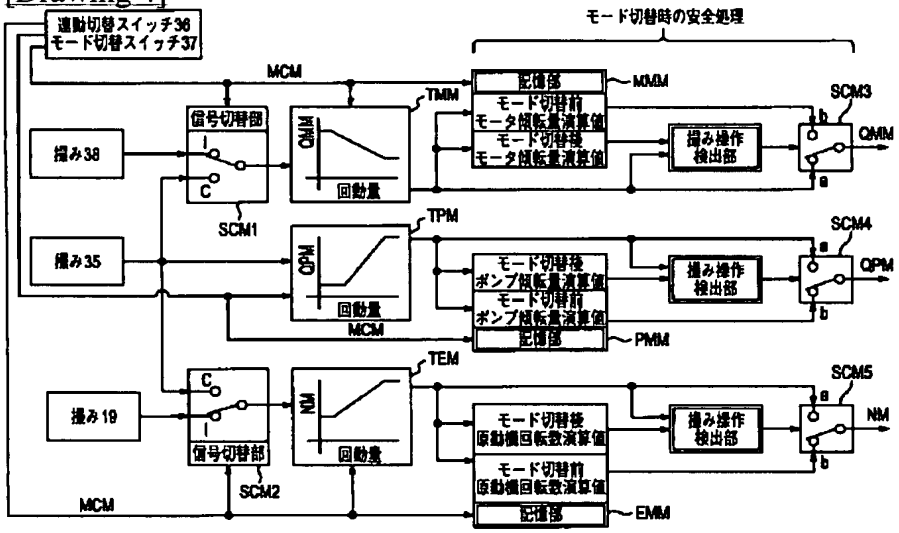
[Drawing 2]



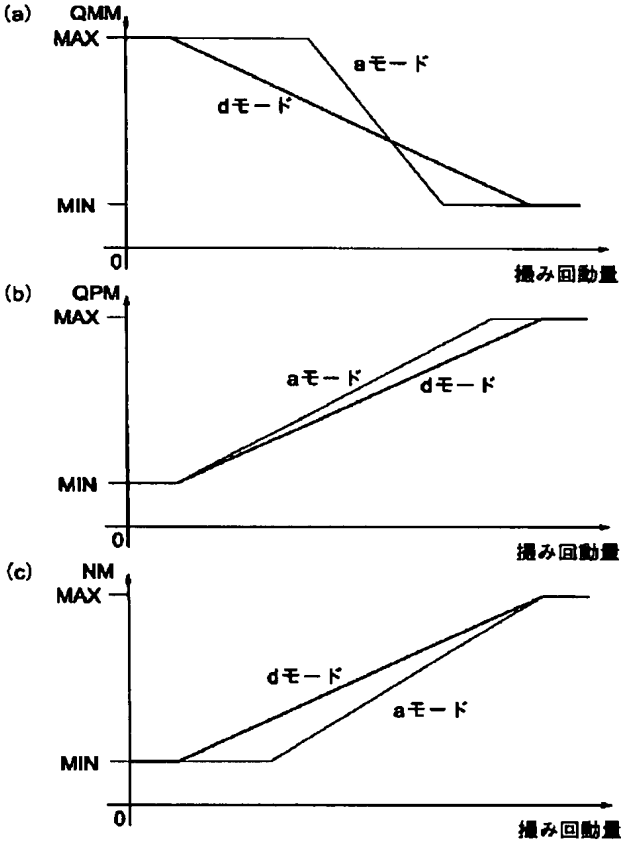
[Drawing 3]



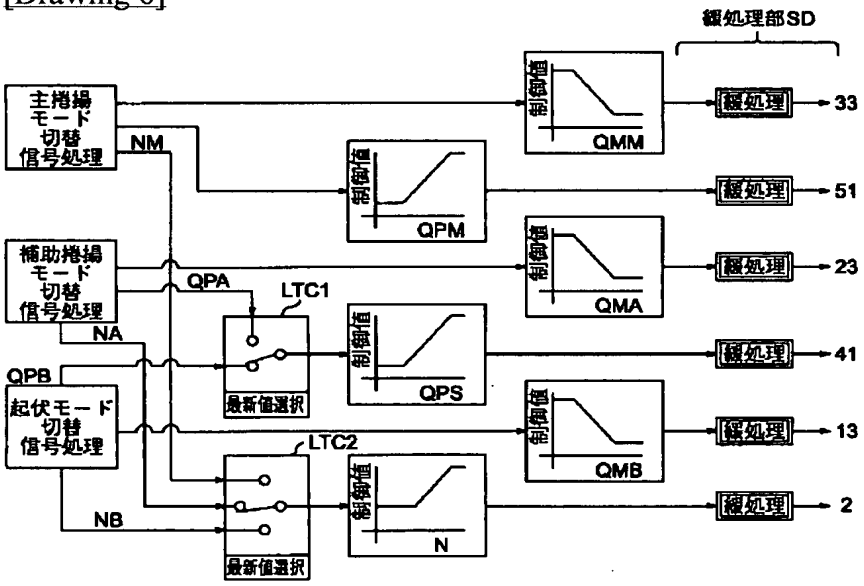
[Drawing 4]



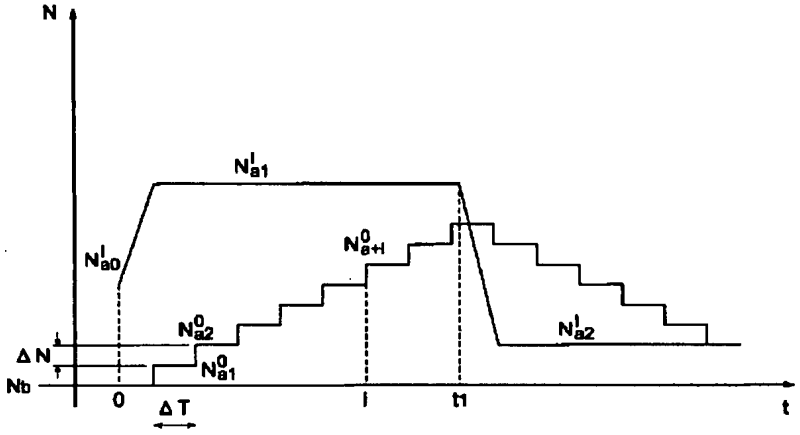
[Drawing 5]



[Drawing 6]



[Drawing 7]



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23/00		23/00	Ｚ	３Ｆ２０５
Ｂ６６Ｄ　1/44		Ｂ６６Ｄ　1/44	Ａ	３Ｈ０８９
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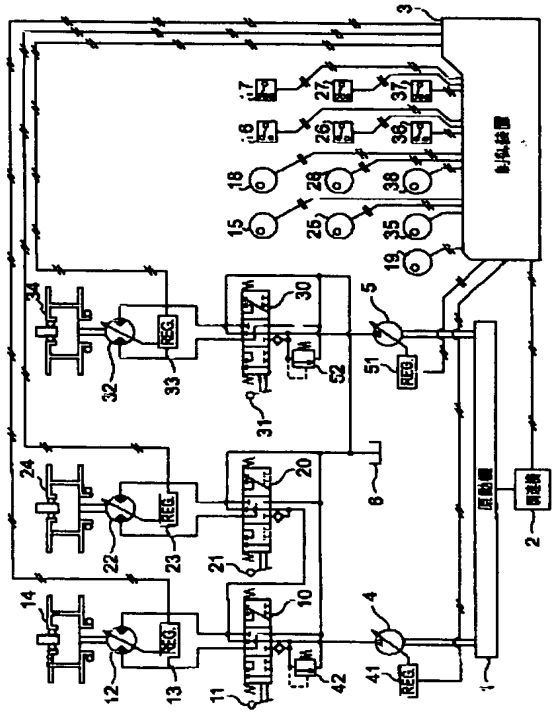
最終頁に続く

(54)【発明の名称】　建設機械の油圧モーターの最高速度設定装置

(57)【要約】　（修正有）
【課題】　任意の操作レバーを操作しながら、油圧モーターの最高速度の設定が広範囲に容易にでき、さらに、作業環境や作業状況に適した作業モードに容易に切り替えることができる。
【解決手段】　起伏用操作レバー１１、補助巻揚げ用操作レバー２１および主巻揚げ用操作レバー３１の頂部および頭部にそれぞれ副油圧ポンプ４の傾転角調整機４１と主油圧ポンプ５の傾転角調整機５１の傾転角設定用の撮み１５，２５，３５、連動切替スイッチ１６，２６，３６およびモード切替スイッチ１７，２７，３７を設け、任意の操作レバーを操作しながら、連動切替スイッチを連動側に切り替えると共にモード切替スイッチを切り替えて、モーター傾転量、ポンプ傾転量および原動機回転数を同時変化できるａモードの外に、ポンプ傾転量と原動機回転数だけを同時変化できるｂモードと、モーター傾転量とポンプ傾転量だけを同時変化できるｃモードとを選択できるようにした。



【特許請求の範囲】

【請求項１】　原動機に駆動されて作動油を吐出する油圧ポンプと、該油圧ポンプから吐出された作動油の方向と流量を切り替える複数の方向切替弁を切替え操作するための複数の操作レバーと、前記方向切替弁を介して流入した作動油により回転可能な複数の油圧モーターと、該油圧モーターまたは前記油圧ポンプの傾転角を調整する複数の傾転角調整手段と、前記原動機の回転数を調整する調速機と、前記傾転角調整手段と前記調速機とを制御して前記油圧モーター若しくは前記油圧ポンプの傾転角または前記原動機の回転数を所定の値に設定させることにより、前記油圧モーターの最高速度を設定する制御手段とを具えた建設機械の油圧モーターの最高速度設定装置において、複数の前記操作レバーの握り部近傍に、連動操作と非連動操作とを切り替えるための連動切替スイッチと、該連動切替スイッチが連動側に切り替えられた時に当該操作レバーの操作により動作制御される前記油圧モーターの傾転角と当該油圧モーターに作動油を供給する前記油圧ポンプの傾転角および／または当該油圧ポンプを駆動する前記原動機の回転数を同時に調整する指令値を入力するための速度入力手段とをそれぞれ配設したことを特徴とする建設機械の油圧モーターの最高速度設定装置。

【請求項２】　原動機に駆動されて作動油を吐出する油圧ポンプと、該油圧ポンプから吐出された作動油の方向と流量を切り替える複数の方向切替弁を切替え操作するための複数の操作レバーと、前記方向切替弁を介して流入した作動油により回転可能な複数の油圧モーターと、該油圧モーターまたは前記油圧ポンプの傾転角を調整する複数の傾転角調整手段と、前記原動機の回転数を調整する調速機と、前記傾転角調整手段と前記調速機とを制御して前記油圧モーター若しくは前記油圧ポンプの傾転角および前記原動機の回転数を所定の値に設定させることにより、前記油圧モーターの最高速度を設定する制御手段とを具えた建設機械の油圧モーターの最高速度設定装置において、少なくとも一つの前記操作レバーの握り部近傍に、連動操作と非連動操作とを切り替えるための連動切替スイッチと、前記連動切替スイッチが連動側に切り替えられた時に当該操作レバーの操作により動作制御される前記油圧モーターの傾転角と当該油圧モーターに作動油を供給する前記油圧ポンプの傾転角および／または当該油圧ポンプを駆動する前記原動機の回転数を同時に調整する指令値を入力するための速度入力手段とを配設すると共に、任意の場所に、前記連動切替スイッチが連動側に切り替えられた時に当該操作レバーの操作により動作制御される前記油圧モーターの傾転角と当該油圧モーターに作動油を供給する前記油圧ポンプの傾転角および当該油圧ポンプを駆動する前記原動機の回転数を同時に調整し得る３連動モードと、当該油圧モーターの傾転角と当該油圧ポンプの傾転角または当該原動機の回転数の何れか一方を同時に調整し得る２連動モードとの少なくとも二つのモードを切り替えるためのモード切替手段を配設したことを特徴とする建設機械の油圧モーターの最高速度設定装置。

【請求項３】　原動機に駆動される複数の油圧ポンプを具え、速度入力手段は操作レバーの操作により動作制御される油圧モーターに作動油を供給する油圧ポンプの傾転角を所定の値に設定する設定値を入力するための傾転角入力手段であり、該傾転角入力手段に設定値を入力することにより、前記油圧ポンプの傾転角と共に該油圧ポンプが作動油を供給する前記油圧モーターの傾転角および／または当該油圧ポンプを駆動する原動機の回転数を同時にそれぞれ所定の値に設定されるようにしたことを特徴とする請求項１または２記載の建設機械の油圧モーターの最高速度設定装置。

【請求項４】　連動切替スイッチが非連動側に切り替えられた時に当該操作レバーの操作により動作制御される油圧モーターの傾転角および当該油圧モーターに作動油を供給する油圧ポンプの傾転角をそれぞれ所定の値に独立して設定する設定値を入力するための二つの傾転角入力手段と、原動機の回転数を所定の値に独立して設定する設定値を入力するための回転数入力手段とを具えたことを特徴とする請求項１または２記載の建設機械の油圧モーターの最高速度設定装置。

【請求項５】　制御手段は同一の油圧ポンプの傾転角または同一の原動機の回転数を所定の値に設定するための複数の指令値を受け取った時は、それらの値の中、最新の指令値を選択するようにしたことを特徴とする請求項１または２記載の建設機械の油圧モーターの最高速度設定装置。

【請求項６】　制御手段は同一の油圧ポンプの傾転角または同一の原動機の回転数を所定の値に設定するための複数の指令値を受け取った時は、それらの値の中、最大または最小の指令値を選択するようにしたことを特徴とする請求項１または２記載の建設機械の油圧モーターの最高速度設定装置。

【請求項７】　連動切替スイッチまたはモード切替手段の切替え動作の後、油圧モーター若しくは油圧ポンプの傾転角または原動機の回転数を所定の値に設定するための指令値に許容値以上の変化が生じた時は、当該変化を緩和した指令値を出力するようにしたことを特徴とする請求項１乃至６の何れか記載の建設機械の油圧モーターの最高速度設定装置。

【請求項８】　制御手段は連動切替スイッチまたはモード切替手段の切替え動作の後、速度入力手段、傾転角入力手段または回転数入力手段に入力された指令値が所定量以上変化した時に切替え動作後の指令値を、また、入力された指令値が所定量以上変化しなかった時に切替え動作前の指令値を指令値として出力するようにしたことを特徴とする請求項１または２記載の建設機械の油圧モ

ーターの最高速度設定装置。
【請求項９】　建設機械はクレーンであり、油圧モーターの中、少なくとも一つは吊荷の捲揚げ用油圧モーターであることを特徴とする請求項１または２記載の建設機械の油圧モーターの最高速度設定装置。
【発明の詳細な説明】
【０００１】
【発明が属する技術分野】本発明は傾転量可変型油圧モーターを具えて、その速度制御域が低速から高速まで広範囲に亘るクレーン等の建設機械の油圧モーターの最高速度設定装置に関する。
【０００２】
【従来の技術】油圧式クレーンでは主フックと補助フックで吊り下げた荷物をその姿勢を保持しながら所定の場所まで移動し、そこに位置決めしながら静かに荷下ろしする作業を行うことが多い。このような場合には、荷下ろし時、あるいは荷物の揚げ始め時は微速度で吊り下ろし、あるいは吊り揚げる必要があるが、その途中の吊り揚げおよび吊り下ろし時はなるべく速やかな捲き上げ、捲き下ろし動作を行うのが望ましい。一般に、油圧モーターの速度制御は方向切替弁の切替え操作により行われるが、微速度制御を行う場合は方向切替弁を全開にした時の最大速度が遅い程、制御し易い。そこで、運転者は原動機回転数、油圧ポンプおよび油圧モーターの傾転量を調整する撮みをそれぞれ廻して、油圧モーターの最大速度が遅くなるように設定した後、微速度制御を行うようにしている。
【０００３】一方、途中の吊り揚げおよび吊り下ろし時には、この儘では方向切替弁を全開にしても速い速度は得られないので、上記撮みを逆に廻して高速捲き揚げができるようにしている。しかし、このような操作は、一方の手で方向切替弁を切り替える操作レバーを操作しながら、もう一方の手で操作盤等に設置された撮みに手を延ばして３つの撮みを操作することになり、運転者にとって煩わしい操作であると共に、一時、吊り荷等から目を離さなければならず、吊り荷の衝突や事故が発生する危険もあった。
【０００４】かかる課題を克服すべく様々な技術開発が為されているが、例えば、運転者がほぼ常時把持して操作する旋回レバーに回転式撮みを装備し、連動モード選択時に、この旋回レバーの撮みを回動操作すると、原動機回転数、油圧ポンプおよび油圧モーターの傾転量を同時に可変制御できるようにした自走式油圧クレーンが開発され、実用に供されている。
【０００５】
【発明が解決しようとする課題】上記油圧クレーンでは微速度捲き揚げから高速捲き揚げ、高速捲き降ろしから微速度捲き降ろしの作業操作を行う場合に、上記撮みを回動操作するだけで原動機回転数、油圧ポンプおよび油圧モーターの傾転量の３つの制御量が同時に連続的に変化するから、油圧モーターの最大速度を広範囲に亘って変えることができ、荷物の吊り揚げおよび吊り降ろし作業の操作性を大きく改善したものとなっている。
【０００６】しかしながら、上記従来技術では撮みの回動操作により、原動機回転数、油圧ポンプおよび油圧モーターの傾転量が全て同時に増大または減少するため、例えば、住宅地近傍で夜間または早朝に荷吊り作業を行う場合に、原動機が高速回転すると、住人に騒音被害を及ぼしてしまうので、連動モードの選択による高速の荷積み作業は行えない。また、荷重の大きな荷物の荷吊り作業を行う場合に、高速吊り揚げ操作を行うと共に上記撮みを高速側に回動させると、油圧モーターの傾転量が小さくなるため油圧モーターの負荷圧が増大し、それがある限度を越えると、負荷圧が大きい方の油圧モーターの流入側油圧回路保護用の調圧弁が開路し、その油圧モーターには油圧ポンプからの吐出油が流入せず、当該油圧モーターが停止してしまう。このような状態になると、他方の油圧モーターのみが回転して荷物の片側を急速に吊り揚げるから、荷物が片吊り状態になり、他方の油圧モーターにも大きな負荷圧が掛り、上記と同様の原因で他方の油圧モーターも停止し、荷物を吊り揚げることができなくなることがある。
【０００７】さらに、撮みの回動操作による高速－低速の切替えは特定のアクチュエーターに対応させることができないから、例えば、高速の荷吊り作業を行いながら、ゆっくり旋回させようとした時、旋回操作がし辛くなるといった不具合も生じる。本発明は従来技術におけるかかる問題点を解消すべく為されたものであり、任意の操作レバーを操作しながら、油圧モーターの最高速度の設定を広範囲に容易に行うことができ、さらに、作業環境や作業状況に適した作業モードに容易に切り替えることができ、運転者の意図に沿った作業を遂行できる建設機械の油圧モーターの最高速度設定装置を提供することを目的とする。
【０００８】
【課題を解決するための手段】本発明は上記課題を解決するために、油圧モーターまたは油圧ポンプの傾転角を調整する複数の傾転角調整手段と原動機の回転数を調整する調速機とを制御して油圧モーター若しくは油圧ポンプの傾転角または原動機の回転数を所定の値に設定させることにより、油圧モーターの最高速度を設定する制御手段とを具えると共に、複数の操作レバーの握り部近傍に、連動操作と非連動操作とを切り替えるための連動切替スイッチと、該連動切替スイッチが連動側に切り替えられた時に当該操作レバーの操作により動作制御される油圧モーターの傾転角と当該油圧モーターに作動油を供給する油圧ポンプの傾転角および／または当該油圧ポンプを駆動する原動機の回転数を同時に調整する指令値を入力するための速度入力手段とをそれぞれ配設したもの、あるいは、少なくとも一つの操作レバーの握り部近

傍に、前記連動切替スイッチと、前記速度入力手段を配設すると共に、任意の場所に、連動切替スイッチが連動側に切り替えられた時に当該操作レバーの操作により動作制御される油圧モーターの傾転角と当該油圧モーターに作動油を供給する油圧ポンプの傾転角および当該油圧ポンプを駆動する原動機の回転数を同時に調整し得る３連動モードと、当該油圧モーターの傾転角と当該油圧ポンプの傾転角または当該原動機の回転数の何れか一方を同時に調整し得る２連動モードとの少なくとも二つのモードを切り替えるためのモード切替手段とを配設したものである。

【０００９】また、好ましくは、原動機に駆動される複数の油圧ポンプを具えて、速度入力手段は操作レバーの操作により動作制御される油圧モーターに作動油を供給する油圧ポンプの傾転角を所定の値に設定する設定値を入力するための傾転角入力手段であり、該傾転角入力手段に設定値を入力することにより、油圧ポンプの傾転角と共に該油圧ポンプが作動油を供給する油圧モーターの傾転角および／または当該油圧ポンプを駆動する原動機の回転数を同時にそれぞれ所定の値に設定されるようにしたり、制御手段は同一の油圧ポンプの傾転角または同一の原動機の回転数を所定の値に設定するための複数の指令値を受け取った時は、それらの値の中、最新の指令値若しくは最大または最小の指令値を選択するようにし、連動切替スイッチまたはモード切替手段の切替え動作の後、油圧モーター若しくは油圧ポンプの傾転角または原動機の回転数を所定の値に設定するための指令値に許容値以上の変化が生じた時は、当該変化を緩和した指令値を出力するようにし、さらに、制御手段は連動切替スイッチまたはモード切替手段の切替え動作の後、速度入力手段、傾転角入力手段または回転数入力手段に入力された指令値が所定量以上変化した時に切替え動作後の指令値を、また、入力された指令値が所定量以上変化しなかった時に切替え動作前の指令値を指令値として出力するようにしたものである。

【００１０】

【発明の実施の形態】以下、図面を参照して本発明の一実施例を詳細に説明する。図１、図２および図３はそれぞれ本発明の実施例に係る油圧クレーンの主要油圧回路図、操作部の正面図および側面図である。これらの図において、１は図示しない油圧クレーンの駆動源である原動機、２は原動機１の回転数を制御する調速機、３は運転者の後述する切替スイッチや操作入力に従って原動機１の回転数、後述する油圧ポンプや油圧モーターの傾転角を可変制御する制御装置、４，５は原動機１に連結されて回転し、アクチュエーターに作動油を供給する作動油供給源である副および主油圧ポンプ、６は作動油を貯溜する油タンクである。

【００１１】また、１０は運転者の操作に従って油圧ポンプ４から吐出された作動油の方向と流量を切り替えて後述する起伏用油圧モーターに供給する起伏方向切替弁、１１はこの起伏方向切替弁１０を切替え操作するための起伏用操作レバー、１２は油圧クレーンのブームを起伏させるための起伏用油圧モーター、１３は起伏用油圧モーター１２の傾転角を調整する傾転角調整機、１４は図示しないブームの起伏用ドラム、２０～２４は補助捲揚げ機に係る同様の構成要素を示した符号であり、２０は補助捲揚げ方向切替弁、２１は補助捲揚げ用操作レバー、２２は補助捲揚げ用油圧モーター、２３は補助捲揚げ用油圧モーター２２の傾転角調整機、２４は補助捲揚げ機用ドラム、さらに、３０～３４は主捲揚げ機に係る同様の構成要素を示した符号であり、３０は主揚げ方向切替弁、３１は主捲揚げ用操作レバー、３２は主捲揚げ用油圧モーター、３３は主捲揚げ用油圧モーター３２の傾転角調整機、３４は主捲揚げ機用ドラムである。

【００１２】また、１５，１６，１７はそれぞれ起伏用操作レバー１１の頂部、頭部および取付部に配設され、副油圧ポンプ４の傾転角調整機４１の傾転角設定用の撮み、撮み１５の回動指令値の連動、非連動の切替えを行うための連動切替スイッチおよび連動モードを選択した際のモード切替えを行うためのモード切替スイッチ、２５，２６，２７および３５，３６，３７はそれぞれ補助捲揚げ用操作レバー２１および主捲揚げ用操作レバー３１の頂部、頭部および取付部に配設された操作入力手段であり、副油圧ポンプ４の傾転角調整機４１と主油圧ポンプ５の傾転角調整機５１の傾転角設定用の撮み、それぞれの連動切替スイッチおよびモード切替スイッチである。

【００１３】１８，２８，３８はそれぞれ起伏用操作レバー１１、補助捲揚げ用操作レバー２１および主捲揚げ用操作レバー３１の足元部に配設され、それぞれ起伏用油圧モーター１２、補助捲揚げ用油圧モーター２２および主捲揚げ用油圧モーター３２の傾転角設定撮み、１９は原動機１の回転数を設定するための原動機回転数設定撮み、４１，５１はそれぞれ副および主油圧ポンプ４，５の傾転角調整機、４２，５２はそれぞれ副および主油圧ポンプ４，５の流出側管路内の油圧がある限度を越えると開路し、当該油圧回路を過大圧から保護する調圧弁である。

【００１４】本実施例では副および主油圧ポンプ４，５と、起伏用油圧モーター１２、補助捲揚げ用油圧モーター２２および主捲揚げ用油圧モーター３２とは全て吐出量可変型のもので構成され、起伏用油圧モーター１２と補助捲揚げ用油圧モーター２２とは起伏方向切替弁１０および補助捲揚げ方向切替弁２０を介して直列接続されて副油圧ポンプ４から供給される作動油で駆動され、主捲揚げ用油圧モーター３２は単独で主油圧ポンプ５から供給される作動油で駆動されるように構成されている。また、撮み１５，１８，１９，２５，２８，３５，３８は可変抵抗器に連結されていて、それらの負荷抵抗の電

圧値が検出され、連動切替スイッチ１６，２６，３６は２接点切替スイッチで、モード切替スイッチ１７，２７，３７はトグル式の３接点切替スイッチでそれぞれ構成されている。なお、図１に示した油圧回路の外に、走行用油圧モーターおよび旋回用油圧モーターを駆動するための油圧回路が存在するが、本発明の要旨とは関係がないので図示および説明を省略している。

【００１５】連動切替スイッチ１６，２６，３６が連動側に切り替えられた時、撮み１５，２５，３５の操作回動量に応じた指令信号が制御装置３に入力され、制御装置３ではモード切替スイッチ１７，２７，３７の切替え位置に応じたモードの出力指令値が演算される。演算された出力指令値は調速機２と、副および主油圧ポンプ４，５の傾転角調整機４１，５１と、起伏用油圧モーター１２、補助捲揚げ用油圧モーター２２および主捲揚げ用油圧モーター３２の傾転角調整機１３，２３，３３との対応する組の中、少なくとも２つに対して出力される。これに対して、連動切替スイッチ１６，２６，３６が非連動側に切り替えられた時は、ポンプの傾転角設定用の撮み１５，２５，３５からの指令信号は各々の操作レバー１１，２１，３１に対応する副および主ポンプ４，５の傾転角設定用としてのみ機能し、指令信号に応じた出力指令値がそれぞれ傾転角調整機４１，５１に出力される。

【００１６】一方、モーターの傾転角設定用の撮み１８，２８，３８および原動機回転数設定用の撮み１９からの指令信号に応じた出力指令値はそれぞれ傾転角調整機１３，２３，３３および調速機２に出力される。これらの出力指令値によりそれぞれの傾転角や回転数が設定され、起伏用油圧モーター１２、主捲揚げ用油圧モーター２２および補助捲揚げ用油圧モーター３２の最大回転速度が決定される。各操作レバー１１，２１の撮み１５，２５からは共に１つの副油圧ポンプ４の傾転角を設定するための指令信号が出力されるから、制御装置３は後述する最新値選択処理により何れか一方の指令信号を選択し、副油圧ポンプ４の傾転角調整機４１に出力指令値として出力する。

【００１７】運転者は各操作レバー１１，２１，３１の中の一つあるいは二つを操作しながら上述の連動切替スイッチ１６，２６，３６とモード切替スイッチ１７，２７，３７の中の一つあるいは二つの切替え操作を行うと共に、撮み１５，２５，３５あるいは撮み１８，１９，２８，３８の回動操作を行って所望の油圧モーター１２，２２，３２の最大回転速度を適宜設定することにより、荷積、穴堀り等の建設作業を効率良く円滑に遂行することができる。なお、図１には示していないが、上述の油圧モーター１２，２２，３２の駆動回路には当該油圧モーター１２，２２，３２に過負荷が作用した時、自動的に傾転角を増大させて副および主油圧ポンプ４，５に過大な負荷が掛かるのを防止する過大負荷保護回路が付加されている。また、本実施例では原動機１に２つの副および主油圧ポンプ４，５が連結され、副油圧ポンプ４の流出側油路に起伏方向切替弁１０および補助捲揚げ方向切替弁２０を介して起伏用油圧モーター１２と補助捲揚げ用油圧モーター２２が直列接続された構成となっているが、これは一例に過ぎず、油圧ポンプは１つまたは３つ以上でも良く、油圧モーターは並列接続された構成であっても良い。

【００１８】次に、本実施例の動作を説明する。上述のように、本実施例では全ての操作レバー、即ち、起伏用操作レバー１１、補助捲揚げ用操作レバー２１および主捲揚げ用操作レバー３１にそれぞれ連動切替スイッチ１６，２６，３６と副および主油圧ポンプ４，５の傾転角設定用の撮み１５，２５，３５が設けられているから、例えば、非連動モードを選択して３つの上記操作レバー１１，２１，３１の中の一つあるいは二つを操作している時に、連動モードに切り替えて当該油圧モーター１２，２２，３２の最高速度を大きく変更したい場合に、その手を放さずにそれぞれの連動切替スイッチ１６，２６，３６の何れかを連動側に切り替えると共にその撮み１５，２５，３５を回動操作することにより、当該油圧モーター１２，２２，３２の最高速度を最低速から最高速まで連続的に容易に変化させることができる。

【００１９】図４は主捲揚げ用操作レバー３１を操作している時に連動切替スイッチ３６およびモード切替スイッチ３７を切替え操作した時の撮み１９，３５，３８の回動操作に応じた信号処理系統を表す信号処理系統図である。なお、以下に述べる主捲揚モード切替信号処理での撮み操作検出部や緩処理部等における信号処理は制御装置３で行われるプログラムに基づいた信号処理に対応する。例えば、荷物を高速で吊り揚げしようとする場合は、運転者は主捲揚げ用操作レバー３１を操作しながら連動切替スイッチ３６を上側に倒して連動モードに切り替え、さらに、モード切替スイッチ３７を上側に倒してａモードに切り替えて効率の良い荷吊り作業を行うが、作業が夜間にまで及び、かつ、重い荷物を荷揚げする場合は、騒音を発しないようにするために原動機１の回転数を落とさなければならず、しかも、過大負荷保護回路を動作させないため補助および主捲揚げ用油圧モーター２２，３２の傾転角をあまり小さくすることができない。このため、運転者は連動切替スイッチ３６を下側に倒して非連動モードに切り替える。これにより、「非連動」を表すモード切替信号ＭＣＭが主信号切替部ＳＣＭ１，ＳＣＭ２、主モーター傾転特性記憶部ＴＭＭ、主ポンプ傾転特性記憶部ＴＰＭ、原動機回転特性記憶部ＴＥＭおよび主モーターデータ記憶部ＭＭＭ、主ポンプデータ記憶部ＰＭＭ、原動機データ記憶部ＥＭＭに出力される。

【００２０】このモード切替信号ＭＣＭによるモード切替え処理により、主信号切替部ＳＣＭ１，ＳＣＭ２では

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APPLICANT : YUTANI HEAVY IND LTD;

INVENTOR : TONO MASAAKI;

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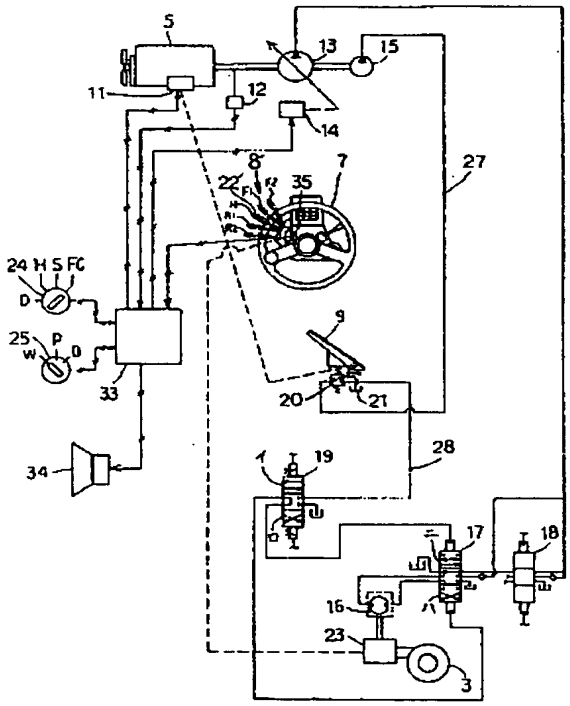
TITLE : CONTROLLER FOR TRAVELLING OF WHEEL TYPE SHOVEL



ABSTRACT : PURPOSE: To prevent a malfunction by inputting each signal from an operation mode changeover switch, a brake operation changeover switch and a shift lever device to a controller and outputting a signal from a caution arousing device.

CONSTITUTION: A limit switch 35 is installed to a shift lever device 8', and a changeover operating signal is input to a controller 33. Each signal from a travelling-operation mode changeover switch 24 and a brake operation changeover switch 25 is set so as to be input to the controller 33. The travelling- operation mode changeover switch 24 is located at the positions of operation modes (except D), but a caution signal is output to a caution arousing device 34 from the controller 33 when the brake operation changeover switch 25 is worked at positions except the position of operation W and a shift lever 22' is worked at locations except a neutral position N. Accordingly, a driver can correspond to situations safely.

内部の切替スイッチが非連動Ｉ側にそれぞれ切り替えられ、主モーター傾転特性記憶部ＴＭＭ、主ポンプ傾転特性記憶部ＴＰＭ、原動機回転特性記憶部ＴＥＭではそれぞれ非連動（ｄモード）に対応する傾転特性表が読み出される。そして、主モーターデータ記憶部ＭＭＭ、主ポンプデータ記憶部ＰＭＭ、原動機データ記憶部ＥＭＭではそれぞれモード切替前のモーター傾転量演算値、即ち、撮み３８の回動量に対応したモーター傾転量演算値QMM_bとモード切替後のモーター傾転量演算値QMM_aとが、同様に、モード切替前のポンプ傾転量演算値、即ち、撮み３５の回動量に対応したポンプ傾転量演算値QPM_bとモード切替後のポンプ傾転量演算値QPM_aとが、さらに、モード切替前の原動機回転数演算値、即ち、撮み１９の回動量に対応した原動機回転数演算値NM_bとモード切替後の原動機回転数演算値NM_aとが記憶される。

【００２１】図５は撮み回動量に対する主モーター傾転特性（ａ）、主ポンプ傾転特性（ｂ）および原動機回転特性（ｃ）の一例を示す傾転特性図である。これらの図において、太線は非連動モード、細線は連動ａモード選択時の特性を表す。非連動モード（ｄモード）では各撮み１９，３５，３８がそれぞれ独立して傾転量または回転数設定用として機能するので、制御域を広くするため、傾転特性直線の傾きは緩くなっている。これに対し、連動ａモードでは撮み３５を回動させると、他の撮み１９，３８を同時に操作したのと同等になり、主捲揚げ用油圧モーター３２の最大回転数は急速に増減するから、微速域および高速域ではその変化がやや緩やかにな

$$|QMM_{a+1}-QMM_a|>T_{MM}$$

を満足するか否かを判定する。その判定結果が然りならば、撮み３５または撮み３８が操作されたものと判断して、主信号切替部ＳＣＭ３を切替後ａ側に切り替えてＱＭＭ＝QMM_aを出力し、その判定結果が否ならば、撮

$$|QPM_{a+1}-QPM_a|>T_{PM}$$

$$|NM_{a+1}-NM_a|>T_{NM}$$

を満足するか否かを判定する。それぞれの判定結果が然りならば、撮み３５または撮み３８が操作されたものと判断して、主信号切替部ＳＣＭ４，ＳＣＭ５をそれぞれ切替後ａ側に切り替えてＱＰＭ＝QPM_a，ＮＭ＝NM_aを出力し、それぞれの判定結果が否ならば、撮み３５または撮み３８は操作されなかったものと判断して、主信号切替部ＳＣＭ４，ＳＣＭ５をそれぞれ切替前ｂ側に切り替えて、ＱＰＭ＝QPM_b，ＮＭ＝NM_bを出力する。このように、モード切替え安全処理を経ることにより、操作された撮みから指令値が出力される調整機（調速機）２，３３，５１のみにモード切替え後の指令値が出力される。従って、連動切替スイッチ３６等の切替え操作により、機械的に調整機（調速機）２，３３，５１に対する指令値が不連続的に切り替わり、主捲揚げ用油圧モーター３２が暴走するのを防止することができる。

るように、主モーター傾転特性直線の微速域および高速域、主ポンプ傾転特性直線の高速域と原動機回転特性直線の微速域には平坦部が設けられている。つまり、微速域および高速域では撮み３５の回動変化に対して主捲揚げ用油圧モーター３２の最大回転数は一次または二次関数的に増減し、中速域では三次関数的に急速に増減する。これにより、微速域での主捲揚げ用油圧モーター３２の最大回転数設定操作の操作性を確保しながら、微速域と高速域との間の移行設定操作を速やかに行うことができる。

【００２２】ところで、連動切替スイッチ３６およびモード切替スイッチ３７の切替え操作により、作業モードが切り替えられると、傾転特性表に基づいて傾転量を決定するための指令値が不連続的に変化する虞がある。これにより、例えば、原動機１や油圧モーター１２，２２，３２が突然、高速回転を始めると非常に危険である。そこで、本実施例では連動切替スイッチ３６が切替え操作された後、該当する撮みが操作されたか否かを撮み操作検出部ＤＯＤで判定し、操作されなかった場合は、当該撮みの指令値をモード切替え前の値に保つ切替え安全処理を行うようにしている。

【００２３】即ち、制御装置３は主モーターデータ記憶部ＭＭＭ、主ポンプデータ記憶部ＰＭＭ、原動機データ記憶部ＥＭＭからそれぞれモード切替直後とプログラム１周期ΔＴ後のモーター傾転量演算値QMM_{a+1}，QMM_a、ポンプ傾転量演算値QPM_{a+1}，QPM_aおよび原動機回転数演算値NM_{a+1}，NM_aを読み出すと共に、

……（１）

み３５または撮み３８は操作されなかったものと判断して、主信号切替部ＳＣＭ３を切替前ｂ側に切り替えてＱＭＭ＝QMM_bを出力する。

【００２４】同様に、

……（２） および

……（３）

【００２５】上述のように、本実施例では連動切替スイッチ３６を連動モードに切り替えると共にモード切替スイッチ３７を切替え操作することにより、複数の連動モードを選択することができる。以下に複数の連動モードの内容を説明する。

【００２６】(i) ａモード

ａモードが選択された時は、モード切替信号ＭＣＭにより主信号切替部ＳＣＭ１，ＳＣＭ２内部の切替スイッチが共に連動Ｃ側にそれぞれ切り替えられ、撮み３５の回動指令値は主油圧ポンプ５の傾転量指令値としてばかりでなく、主捲揚げ用油圧モーター３２の傾転量指令値および原動機１の回転数指令値としての機能を果たす。

【００２７】つまり、連動ａモード選択時は撮み１９，３８の回動指令値は無視され、撮み３５の回動指令値はポンプ傾転量設定用指令値としてのみならず、モーター

傾転量設定用の指令値および原動機回転数設定用の指令値としても機能する。従って、操み３５を回動させるとモーター傾転量ＱＭＭ、ポンプ傾転量ＱＰＭおよび原動機回転数ＮＭの３つの傾転量指令値が連動して変化する。ａモードでは操み３５の回動操作により制御できる主捲揚げ用油圧モーター３２の最高速度設定域が広いので、低速作業から急に高速作業へ、あるいはこの逆に変化する作業を繰り返し行う、やや軽荷重の多くの荷物の荷積作業を行う場合に適している。

【００２８】(ii)ｂモード

ｂモードが選択された時は、モード切替信号ＭＣＭにより主信号切替部ＳＣＭ２内部の切替スイッチのみが連動Ｃ側に切り替えられ、操み３５の回動指令値は主油圧ポンプ５の傾転量指令値としてばかりでなく、原動機１の回転数指令値としての機能を果たす。従って、操み３５を回動させるとポンプ傾転量ＱＰＭおよび原動機回転数ＮＭの２つの入力指令値が連動して変化する。一方、モーター傾転量ＱＭＭは操み３８の回動指令値に従って設定される。

【００２９】例えば、ａモードで吊荷を高速捲揚げするため操み３５を大きく廻してモーター傾転量ＱＭＭが微小になった時に、重荷重の荷物の荷積作業、特に、２本のロープで１つの吊荷を吊持する同調吊持作業を行う場合に、一方のロープに過荷重が掛かると当該ロープを捲き揚げる油圧モーターの傾転量がポンプ保護回路の動作により強制的に増加させられるため、２本のロープに速度差が生じて吊荷が傾いてしまうという不具合が起きる。しかし、ｂモードではモーター傾転量ＱＭＭは主捲揚げ用操作レバー３１の足元に配設された操み３８の回動操作により独立して設定され、連動指令用の操み３５の回動操作には影響されず操み３８の回動量のみにより決められるようになっているから、上述の不具合の発生を避けることができる。

【００３０】(iii) ｃモード

ｃモードが選択された時は、モード切替信号ＭＣＭにより主信号切替部ＳＣＭ１内部の切替スイッチのみが連動Ｃ側に切り替えられ、操み３５の回動指令値は主油圧ポンプ５の傾転量指令値としてばかりでなく、主捲揚げ用油圧モーター３２の傾転量指令値としての機能を果たす。従って、操み３５を回動させるとモーター傾転量ＱＭＭおよびポンプ傾転量ＱＰＭの２つの傾転量指令値が連動して変化する。一方、原動機回転数ＮＭは操み１９の回動指令値に従って設定される。夜間や住宅地の近傍でａモードやｂモードで高速捲揚げ運転を行うと、原動機回転数ＮＭが大きくなり騒音が生じて近所迷惑になってしまう。このような場合に有用な作業モードとして、原動機回転数ＮＭは連動指令用の操み３５の回動操作によっては変化せず、独立した操み１９の回動操作のみによって決められるｃモードが設定されている。

【００３１】(iv)ｄモード

本実施例では操み３５の回動指令値が他の操みの回動指令値として機能することがない非連動モードをｄモードと呼ぶことにしている。従って、ｄモードはモード切替スイッチ３７による切替え操作ではなく、連動切替スイッチ３６による切替え操作で選択される。以上、主捲揚げ用油圧モーター３２の最高速度を設定する主捲揚モード切替信号処理について説明したが、補助捲揚モード切替信号処理および起伏モード切替信号処理についても全く同様に行われ、それぞれモード切替え処理およびモード切替え安全処理を経て、モーター傾転量ＱＭＡ，ＱＭＢ、ポンプ傾転量ＱＰＡ，ＱＰＢおよび原動機回転数ＮＡ，ＮＢが決定されて出力される。

【００３２】上述のように、本実施例では各々の操作レバー１１，２１，３１に連動切替スイッチ１６，２６，３６を配設すると共にモード切替スイッチ１７，２７，３７を併設して、連動モードとして、モーター傾転量ＱＭＭ，ＱＭＡ，ＱＭＢ、ポンプ傾転量ＱＰＭ，ＱＰＡ，ＱＰＢおよび原動機回転数ＮＭ，ＮＡ，ＮＢを同時変化させることができるａモードの外に、ポンプ傾転量ＱＰＭ，ＱＰＡ，ＱＰＢと原動機回転数ＮＭ，ＮＡ，ＮＢだけを同時変化させることができるｂモードと、モーター傾転量ＱＭＭ，ＱＭＡ，ＱＭＢとポンプ傾転量ＱＰＭ，ＱＰＡ，ＱＰＢだけを同時変化させることができるｃモードとを選択できるようにしたので、同調吊持作業を行う場合や夜間や住宅地の近傍で作業を行う場合等のように、その時の作業内容や作業環境に適した連動作業モードを選択することができるから、運転者の意図に沿った作業を遂行することができる。しかも、連動モードと非連動モードの切替えと、連動モードの作業モードの切替えは何の操作レバー１１，２１，３１を操作していても容易に行えるから、運転者にとって極めて操作性の優れたものとなっている。

【００３３】ところで、本実施例では１つの原動機１で２つの副および主油圧ポンプ４，５を駆動し、副油圧ポンプ４は２つの起伏用油圧モーター１２と補助捲揚げ用油圧モーター２２を回転させる構成となっているので、副油圧ポンプ４の傾転角調整機４１の傾転角ＱＰを設定するための指令値は２つのポンプ傾転量ＱＰＡ，ＱＰＢがあり、また、原動機１の回転数を制御する調速機２の回転数Ｎを設定するための指令値は３つの原動機回転数ＮＭ，ＮＡ，ＮＢがある。そこで、制御装置３はこれらの競合する指令値の中、最適なものを選択する指令値選択処理を行う。

【００３４】図６は各操作レバー１１，２１，３１に関するモード切替信号処理に引き続いて行われる最新値選択処理および緩処理の信号処理系統を表す信号処理系統図である。同図に示すように、図５に示す主捲揚モード切替信号処理を経て出力されたモーター傾転量ＱＭＭおよびポンプ傾転量ＱＰＭは緩処理部ＳＤにより緩処理を受けた後、それぞれ主捲揚げ用油圧モーター３２の傾転

角調整機３３および主油圧ポンプ５の傾転角調整機５１に出力されるが、原動機回転数ＮＭは最新値選択部ＬＴＣ２に出力される。同様に、補助捲揚モード切替信号処理および起伏モード切替信号処理を経て出力されたモーター傾転量ＱＭＡ，ＱＭＢは緩処理部ＳＤにより緩処理を受けた後、それぞれ補助捲揚げ用油圧モーター２２および起伏用油圧モーター１２の傾転角調整機２３，１３に出力されるが、ポンプ傾転量ＱＰＡ，ＱＰＢは最新値選択部ＬＴＣ１に出力され、原動機回転数ＮＡ，ＮＢは最新値選択部ＬＴＣ２に出力される。

【００３５】最新値選択部ＬＴＣ１および最新値選択部ＬＴＣ２ではそれぞれ副ポンプデータ記憶部ＰＭＡ，ＰＭＢおよび原動機データ記憶部ＥＭＡ，ＥＭＢの記憶データが調べられ、ポンプ傾転量ＱＰＡ，ＱＰＢの中、何れか新しいものが副油圧ポンプ４のポンプ傾転量ＱＰとして選択され、また、原動機回転数ＮＭ；ＮＡ，ＮＢの中、何れか新しいものが原動機回転数Ｎとして選択されて、緩処理部ＳＤにより緩処理を受けた後、それぞれ副油圧ポンプ４の傾転角調整機４１および原動機１の調速機２に出力される。

【００３６】このように、本実施例では２つの起伏用および補助捲揚げ用油圧モーター１２，２２が一つの副油圧ポンプ４に駆動され、さらに２つの主および副油圧ポンプ５，４が一つの原動機に駆動される構成となっていても、各操作レバー１１，２１，３１の中、任意のもの、例えば補助捲揚げ用操作レバー２１を操作しながら、その上部に設けられた対応する連動切替スイッチ２６を例えば、「連動」側に切替えると共に撮み２５を回動操作することにより、他の操作レバー１１，３１に設けられた連動切替スイッチ１６，３６および撮み１５，３５の切替えおよび回動状態の如何に拘らず最新の操作に基づく指令値が選択され、それらに従って副油圧ポンプ４の傾転量と原動機１の回転数が一義的に決定される。

【００３７】つまり、現在実行している作業に係わる操作レバーから手を放さずに所望の作業モードを選択すると共に所望の最高速度を設定できるから、例えば、同調吊持作業で吊荷の姿勢を保持しながら静かに吊り上げた後、急速に捲き揚げたり、急に吊り降ろした吊荷を静かに荷台上に載置する操作を、作業遂行のための操作レバーを保持した儘、アクチュエーターの動作速度域を所望の範囲に設定して速やかに、かつ、精度良く実行することができる。

$$N_a{}^{I}-N_{a+i-1}{}^{0}\geqq\Delta N\text{ならば、}\quad N_{a+i}{}^{0}=N_{a+i-1}{}^{0}+\Delta N$$
但し、$N_{a0}{}^{0}=N_b$ ；
$$0<N_a{}^{I}-N_{a+i-1}{}^{0}<\Delta N\text{ならば、}\quad N_{a+i}{}^{0}=N_a{}^{I}\ ;$$
$$N_a{}^{I}-N_{a+i-1}{}^{0}\leqq-\Delta N\text{ならば、}\quad N_{a+i}{}^{0}=N_{a+i-1}{}^{0}-\Delta N\ ;$$
$$0>N_a{}^{I}-N_{a+i-1}{}^{0}>-\Delta N\text{ならば、}\quad N_{a+i}{}^{0}=N_a{}^{I}\qquad\cdots\cdots(4)$$

とする。

【００３８】なお、本実施例では制御装置３が選択して出力するポンプ傾転量や原動機回転数の指令値を最新のものを選択するようにしたが、高速動作を重視する場合は最大のものを選択したり、主に微速作業を行う場合や安全性を重視する場合は最小のものを選択するようにしても良い。

【００３９】次に、制御装置３で行われる信号処理の最後に行われる緩処理部ＳＤでの緩処理を説明する。上述のように、原動機１の調速機２や主および副油圧ポンプ５，４の傾転角調整機５１，４１に出力される指令値はモード切替安全処理によりモード切替え後、操作された撮みの回動指令値のみがモード切替え後の指令値として出力されるようになっているが、新たに設定されたモード切替え後の指令値がモード切替え前の指令値から不連続的に変化する場合があり、その場合に荷揺れが生じる等の危険な状態になる虞がある。そこで、本実施例では出力指令値に不連続的変化が生じないように、入力指令値に不連続的変化がある場合は、その変化を緩やかにする緩処理を施して上記不具合の発生を防止するようにしている。具体例として、例えば、最新値選択処理を経て緩処理部ＳＤに出力された原動機回転数Ｎに不連続的変化が生じた場合について説明する。モード切替え前の入力原動機回転数をN_b、モード切替え後の入力原動機回転数を$N_a{}^{I}$、モード切替え後のプログラムｉ周期後の出力原動機回転数を$N_{a+i}{}^{0}$、原動機回転数のプログラム１周期ΔＴ後の最大許容変化量をΔＮとすると、

【００４０】図７は原動機回転数Ｎの制御装置３の入力値と出力値の一具体例の時間経過を示す時間経過図である。この具体例ではｔ＝０でモードが切り替えられ、入力原動機回転数がN_bから$N_a{}^{I}$に変化し、さらに、入力原動機回転数が$N_{a0}{}^{I}$から$N_{a1}{}^{1}$（$N_{a1}{}^{1}-N_{a0}{}^{I}>T_N$）に切り替えられ、時刻ｔ＝$t_1$で入力原動機回転数が$N_{a1}{}^{1}$から$N_{a2}{}^{I}$に切り替えられた場合のプログラム周期毎の出力原動機回転数$N_{a+i}{}^{0}$を時間経過を追って示している。モード切替え安全処理で、〔$N_{a0}{}^{I}>T_N$〕によって入力原動機回転数がN_bから$N_a{}^{I}$に変化し、さらに、$N_a{}^{I}-N_{a0}{}^{0}\geqq\Delta N$となっているから、$N_{a1}{}^{0}=N_b+\Delta N$となる。そして、$N_a{}^{I}-N_{a1}{}^{0}\geqq\Delta N$であるから、$N_{a2}{}^{0}=N_b+2\Delta N$というように、出力原動機回転数$N_{a+i}{}^{0}$は階段状に上昇してゆき、時刻ｔ＝$t_1$で入力原動機回転数$N_{a1}{}^{1}$が急激に減少したため、階段状に下降している。

【００４１】このように、入力原動機回転数$N_a{}^{1}$がモード切替え時等に不連続的または急激に変化した時は、上述の緩処理によって出力原動機回転数$N_a{}^{0}$が緩やか

に変化するように出力値を緩和しているので、調速機２や傾転角調整機４１，５１に出力される指令値の急激な変化により荷揺れ等の危険が生じるのを防止することができる。

【００４２】なお、本実施例では連動モード選択時の傾転角および回転数の指令値入力手段として、副および主油圧ポンプ４，５の傾転角設定用の撮み１５，２５，３５を当てたが、これはａモードの外にｂモードとｃモードをも選択し得るようにしたためであり、ａモードの外にｃモードだけ選択し得るもので良ければ、各油圧モーター１２，２２，３２の傾転角設定用の撮み１８，２８，３８を上記指令値入力手段として当てても良い。また、撮み１８，２８，３８は各操作レバー１１，２１，３１の足元部に設けたが、各操作レバー１１，２１，３１の上部に設けても良いし、図示しない操作盤上に配設しても良い。

【００４３】

【発明の効果】以上説明したように請求項１記載の発明によれば、複数の操作レバーの握り部近傍に、連動操作と非連動操作とを切り替えるための連動切替スイッチと、連動モードが選択された時に当該操作レバーの操作により動作制御される油圧モーターの傾転角と当該油圧ポンプの傾転角および／または当該原動機の回転数を同時に調整する指令値を入力するための速度入力手段とをそれぞれ配設したので、何の操作レバーを操作して作業を実施していても、指令入力を連動と非連動とに切り替えて油圧モーターと油圧ポンプのそれぞれの傾転角または当該原動機の回転数を同時に調整する指令値を入力することができるから、操作中の操作レバーから手を離すことなく、油圧モーターの最高速度の設定を低速から高速まで広範囲に容易に行うことができ、操作性を大幅に向上でき、しかも、作業状況に適した作業モードに容易に切り替えることができる。

【００４４】請求項２記載の発明によれば、少なくとも一つの操作レバーの握り部近傍に、連動切替スイッチと、速度入力手段を配設すると共に、任意の場所に、連動切替スイッチが連動側に切り替えられた時に当該操作レバーの操作により動作制御される油圧モーターと当該油圧ポンプの傾転角および当該原動機の回転数を同時に調整し得る３連動モードと、当該油圧モーターと当該油圧ポンプの傾転角または当該原動機の回転数の何れか一方を同時に調整し得る２連動モードとの少なくとも二つのモードを切り替えるためのモード切替手段とを配設したので、低速から高速まで広範囲に油圧モーターの最高速度を設定するような作業ばかりでなく、夜間や住宅地等の作業環境あるいは重荷重の吊荷の吊り揚げ作業等の作業内容に適した作業モードを選択できるから、運転者の意図に沿った作業を遂行することができる。

【００４５】請求項３記載の発明によれば、速度入力手段は操作中の操作レバーの操作により油量制御される油圧ポンプの傾転角を所定の値に設定する設定値を入力するための傾転角入力手段であり、該傾転角入力手段に設定値を入力することにより、該油圧ポンプが作動油を供給する油圧モーターの傾転角および／または当該油圧ポンプを駆動する原動機の回転数を同時にそれぞれ所定の値に設定されるようにしたので、油圧モーターの傾転角と原動機の回転数を独立して設定できる連動モードを設定できるから、作業環境や作業内容に適した作業モードを設定することができる。請求項５記載の発明によれば、制御手段は同一の油圧ポンプの傾転角または同一の原動機の回転数を所定の値に設定するための複数の指令値を受け取った時は、それらの値の中、最新の指令値を選択するようにしたので、それまで操作されていた入力手段からの指令値に従って油圧ポンプの傾転角や原動機の回転数が設定されるから、運転者の意図に最も近い指令値を選択することができる。

【００４６】請求項６記載の発明によれば、制御手段は同一の油圧ポンプの傾転角または同一の原動機の回転数を所定の値に設定するための複数の指令値を受け取った時は、それらの値の中、最大または最小の指令値を選択するようにしたので、作業内容が高速作業または低速作業が多い場合に、それに適した油圧ポンプの傾転角や原動機の回転数の設定を行うことができる。請求項７記載の発明によれば、連動切替動作またはモード切替え動作の後、油圧モーター若しくは油圧ポンプの傾転角または原動機の回転数を所定の値に設定するための指令値に許容値以上の変化が生じた時は、当該変化を緩和した指令値を出力するようにしたので、油圧モーターの急回転による荷揺れや急旋回等の危険が生じるのを防止することができる。

【００４７】請求項８記載の発明によれば、連動切替え動作またはモード切替え動作の後、速度入力手段、傾転角入力手段または回転数入力手段に入力された指令値が所定量以上変化した時に切替え動作後の指令値を、また、入力された指令値が所定量以上変化しなかった時に切替え動作前の指令値を指令値として出力するようにしたので、運転者が操作しない入力手段からの指令値によって油圧モーターの回転が急激に変化することによる危険の発生を防止することができる。

【図面の簡単な説明】

【図１】本発明の実施例に係る油圧クレーンの主要油圧回路図

【図２】同じく、油圧クレーンの操作部の正面図

【図３】同じく、その側面図

【図４】連動切替スイッチおよびモード切替スイッチを切替え操作した時の撮みの回動操作に応じた信号処理系統図

【図５】撮み回動量に対する主モーター傾転特性（ａ）、主ポンプ傾転特性（ｂ）および原動機回転特性（ｃ）の一例を示す傾転特性図

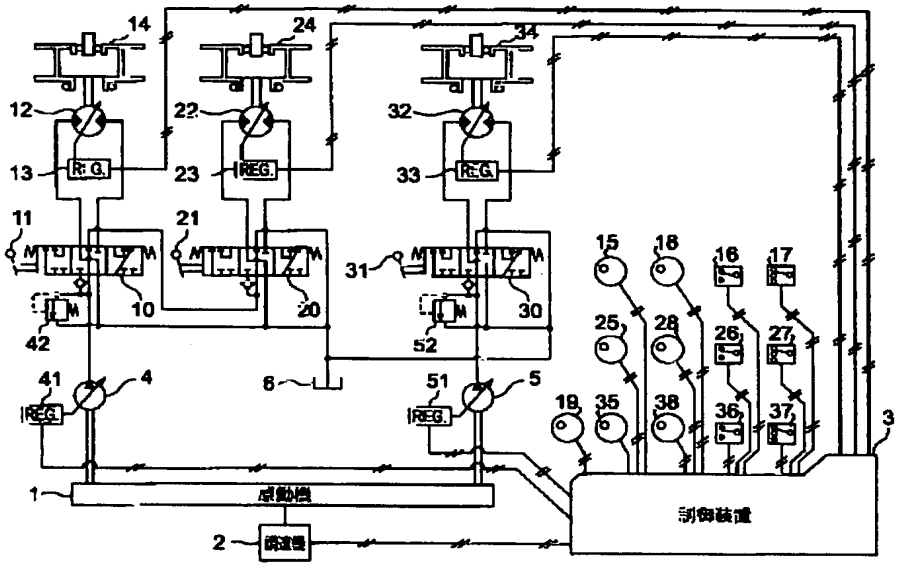
【図6】最新値選択処理および緩処理の信号処理系統を表す信号処理系統図

【図7】原動機回転数の制御装置の入力値と出力値の一具体例の時間経過を示す時間経過図

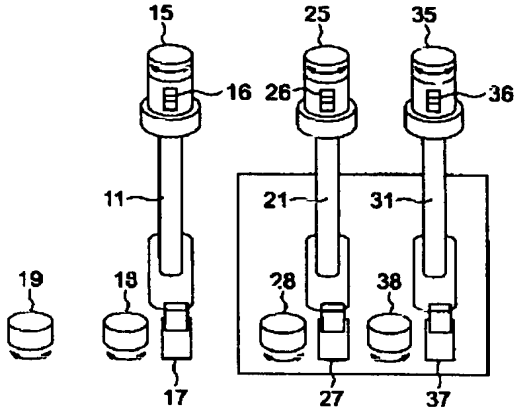
【符号の説明】

1　原動機
2　調速機
3　制御装置
4，5　油圧ポンプ
10，20，30　方向切替弁
11，21，31　操作レバー
12，22，32　油圧モーター
13，23，33，41，51　傾転角調整機
14，24，34　ドラム
15，18，19，25，28，35，38　撮み
16，26，36　連動切替スイッチ
17，27，37　モード切替スイッチ
42，52　調圧弁

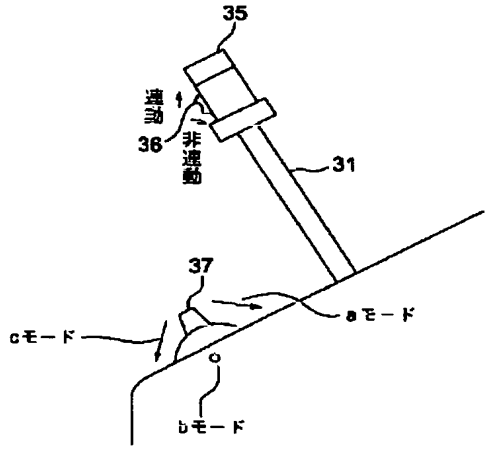
【図1】



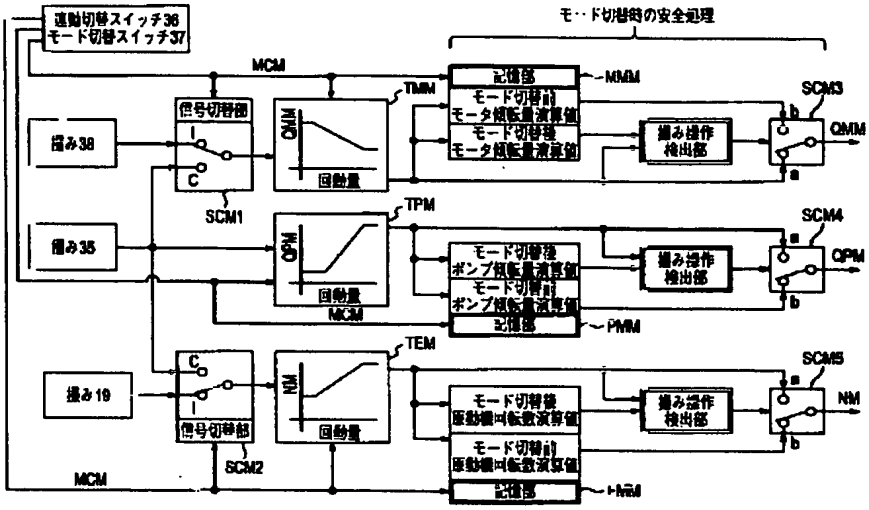
【図2】



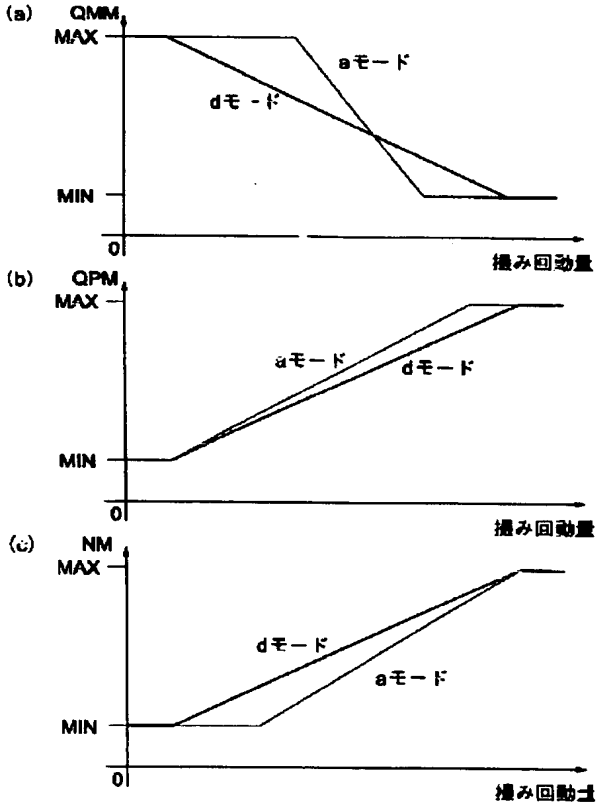
【図3】



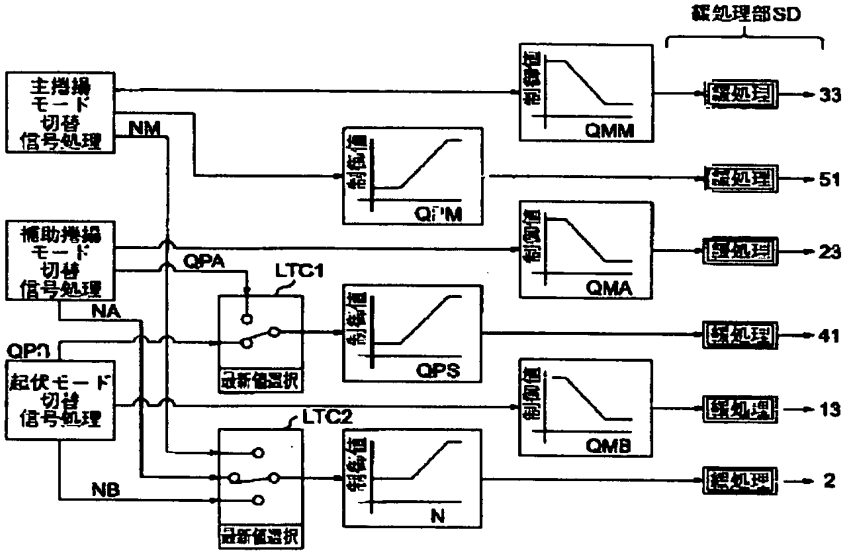
【図4】


走行切替スイッチ36
モード切替スイッチ37
モード切替時の安全処理
MCM
信号切替部
QMM
TMM
MMM
SCM3
QMM
操み38
SCM1
回動量
操み操作検出部
操み35
TPM
SCM4
QPM
PMM
操み19
TEM
SCM5
NM
SCM2
MCM

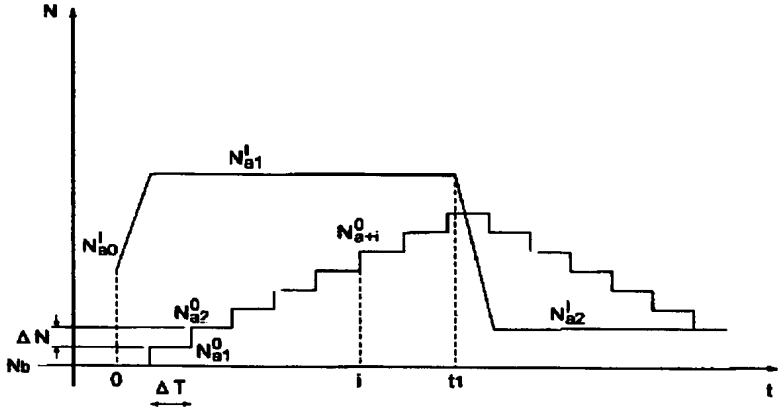
【図5】


(a)
QMM
MAX
aモード
dモード
MIN
0
操み回動量
(b)
QPM
MAX
aモード
dモード
MIN
0
操み回動量
(c)
NM
MAX
dモード
aモード
MIN
0
操み回動量

【図６】



【図７】



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	11/02			11/02	Ｃ
	11/17				Ｅ
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